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February 14, 2014

**SUBMITTED ELECTRONICALLY**

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**Re:      United States, et.al. v. BP products North America Inc.**  
**Northern District of Indiana, Hammond Division**  
**Civil Action No. 2:12 CV 207**  
**Part VIII and Benzene Waste NESHAP Semi-Annual Report**

NO EPA ACTION REQUIRED: Information is being submitted for information purposes only.

In accordance with Part VIII and ¶ 62 of the referenced Consent Decree, attached is the semi-annual report.  
The report is certified pursuant to ¶ 102.

I certify under penalty of law that this information was prepared under my direction or supervision by personnel qualified to properly gather and evaluate the information submitted. Based on my directions and after reasonable inquiry of the person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

If you require additional information, please contact Linda Wilson at (219) 473-3287.

Sincerely,

A handwritten signature in black ink, appearing to read "N. Spencer", written over a horizontal line.

Nick Spencer  
Business Unit Leader  
BP Whiting Refinery

**Attachment**

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9G12

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## **Part VIII and Benzene Waste NESHAP Report BP Whiting Refinery**

### **INTRODUCTION**

The purpose of this document is to fulfill the Part VIII and ¶ 62 semi-annual reporting requirements of the BP Whiting 2012 Consent Decree. The reporting period covered by this report is limited to the period between July 1 – December 31, 2013.

### **REPORT OUTLINE**

The format of this report follows a process where Paragraphs from the Consent Decree which include reporting requirements for the Whiting Refinery are quoted in a text box, followed by a statement of applicability and reporting as appropriate.

The report has been divided into two sections. The first section fulfills the reporting requirements of Part VIII of the Consent Decree, and the latter section fulfills the benzene waste NESHAP reporting requirements outlined in ¶ 62 of the Consent Decree.

The following tables are Tables of Contents for the two sections of the report, which identify the paragraph of the Consent Decree to which the information is responding, and where the information is presented within.

## **Table of Contents**

### **Section I: Part VIII Report**

Reporting and Recordkeeping – CD ¶ 98 .....	6
Summary of Emissions – CD ¶ 98.a .....	6
NOx emissions for each heater and boiler > 40 mmBtu/hr – CD ¶ 99.a .....	6
Sum of NOx emissions for all heaters and boilers < 40 mmBtu/hr – CD ¶ 99.b .....	6
SO <sub>2</sub> , CO and PM emissions for all heaters and boilers – CD ¶ 99.c .....	6
SO <sub>2</sub> Emissions from the Sulfur Recovery Plant– CD ¶ 99.d .....	6
SO <sub>2</sub> emissions from all Acid Gas Flaring and Tail Gas Incidents by flare – CD ¶ 99.e .....	7
NO <sub>x</sub> , SO <sub>2</sub> , PM and CO emissions for all other units – CD ¶ 99.f .....	7
NO <sub>x</sub> , SO <sub>2</sub> , CO and PM emissions for each FCCU – CD ¶ 99.g .....	7
Emissions from Covered Flares and the LPG Flare – CD ¶ 99.h .....	7
Basis for the emissions estimate – CD ¶ 99.i .....	7
Description of any problems – CD ¶ 98.b .....	7
Description of Supplemental Environmental Project – CD ¶ 98.c .....	8
Monitoring Instrument/Equipment Downtime – CD ¶ 98.d .....	8
Downtime of each monitoring instrument for the Covered Flare and the LPG Flare – CD App.D.72.a .....	8
Identification of the periods of downtime by date, time, cause for downtime > 110 hours per calendar quarter – CD App.D.72.b .....	10
Number of hours when the Automatic Control System was overridden – CD App.D.72.c .....	10
Identification of the periods of downtime by date, time, cause for override time > 110 hours per calendar quarter – CD App.D.72.d .....	10
Number of hours when only Pilot Gas or Purge Gas was vented – CD App.D.72.e .....	10
Number of hours of exceedances of the applicable standards during Hours of Applicability – CD App.D.72.f .....	11
Identification of each averaging period that exceeded the standard during the Hours of Applicability – CD App.D.72.g .....	11
Flaring Limitations Exceedances – CD App.D.72.h .....	12
Additional matters – CD ¶ 98.e .....	12
Additional items required by the Consent Decree – CD ¶ 98.f .....	14
Fuel Gas Total Sulfur Monitor Location – CD ¶ 42.a .....	14
CEMS Root Cause Failure Analysis – CD ¶ 48.c .....	14
Dual Carbon Canisters – CD ¶ 52.a.ii .....	14
Single Carbon Canisters – CD ¶ 52.b.ii .....	14
Single Carbon Canister Replacement – CD ¶ 52.b.iv .....	14
Alternate Control/Treatment Devices for BWON – CD ¶ 52.c .....	15
SRP O&M Plan Modifications – CD ¶ 67.c .....	15
SRP Sulfur Storage Tanks – CD ¶ 69.c .....	15
FLIR Monitoring Inspections and Corrective Actions – CD ¶ 75 .....	15
SEP Implementation Progress – CD ¶ 91 .....	17
Emissions limit exceedance for units monitored by CEMS – CD ¶ 100.a .....	17
Emissions limit exceedance for units monitored by stack testing – CD ¶ 100.b .....	17
Results of performance testing on both FCCU units – CD ¶ 101.a .....	17
Copies of all reports required by NSPS Ja – CD ¶ 101.b .....	17
Copies to Citizen-Intervenors of all reports of emission testing– CD ¶ 101.c .....	18
Commercial Unavailability of Low-Leaking Valve or Packing Technology – CD App.B.38(c) .....	18
Minimizing Sweep and Purge Gas Flow – CD App.D.3 .....	18
Waste Gas Minimization Plan – CD App.D.20 .....	19
Prohibition on Discontinuous Wake Dominated Flow or Requirement for Minimum MFR – CD App.D.35.a .....	19
LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.42.d .....	19
Waste Gas Minimization for LPG Flare – CD App.D.43 .....	19
LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.49.c .....	20
Submitting the Internal Flaring Incident reports – CD App.D.57 .....	20
Submitting the Internal Flaring Incident reports – CD App.D.57.g .....	20

Submitting the Internal Flaring Incident reports – CD App.D.57.h .....	20
VOC, SO <sub>2</sub> , H <sub>2</sub> S, CO <sub>2</sub> , methane, and ethane emissions for each Covered Flare and the LPG Flare – CD App.D.7320 .....	

## **Section II: Benzene Waste NESHAP Report – Table of Contents**

Semi-Annual Benzene Waste NESHAP Report – CD ¶ 62. ....	22
EOL Report CD ¶ 62.a.i (1) .....	22
EOL Report CD ¶ 62.a.i (2) .....	22
EOL Report CD ¶ 62.a.i (3) .....	24
EOL Report CD ¶ 62.a.i (4) .....	26
EOL Report CD ¶ 62.a.ii .....	26
EOL Report CD ¶ 62.a.iii .....	27
EOL Report CD ¶ 62.a.iv .....	27
Carbon Canister Report CD ¶ 62.b.i.....	28
Carbon Canister Report CD ¶ 62.b.ii.....	29
Audit Reporting CD ¶ 62.c.....	31
Training Reporting CD ¶ 62.d.....	31
Appendix 7: Carbon Canister Project Completion Report CD ¶ 62.b.i.....	47
Carbon Canister Report CD ¶ CD ¶ 52. ....	47
Carbon Canister Report CD ¶ 52.a.ii - iii .....	47
Carbon Canister Report CD ¶ 52.a.iv .....	48
Carbon Canister Report CD ¶ 52.a.v .....	48
Carbon Canister Report CD ¶ 52.b.i.(1) to 52.b.i.(3) .....	49
Carbon Canister Report CD ¶ 52.b.i.(4) .....	49
Carbon Canister Report CD ¶ 52.b.ii to 52.b.iii .....	50
Carbon Canister Report CD ¶ 52.b.iv.....	50
Carbon Canister Report CD ¶ 52.c.....	51

## **Section III: Appendices**

SRP O&M Plan Update.....	Appendix 1
CEM Summary Performance Reports	
3 <sup>rd</sup> Quarter 2013 CEM Summary Performance Report .....	Appendix 2.a
4 <sup>th</sup> Quarter 2013 CEM Summary Performance Report .....	Appendix 2.b
FCU Performance Testing	
FCU 500 Performance Testing August 2013 .....	Appendix 3.a
FCU 600 Performance Testing December 2013 .....	Appendix 3.b
FCU 500 Performance Testing December 2013 .....	Appendix 3.c
Commercial Unavailability of Low-Leaking Valve Reports.....	Appendix 4
Waste Gas Minimization for LPG Flare.....	Appendix 5
Flare Incident Reports	
South Flare November 18, 2013.....	Appendix 6.a
GOHT Flare November 21, 2013.....	Appendix 6.b
South Flare November 24, 2013.....	Appendix 6.c
VRU Flare December 31, 2013 .....	Appendix 6.d
Dual-Bed Carbon Canister Completion Report.....	Appendix 7
Benzene Waste NESHAP Carbon Canister Report	
3 <sup>rd</sup> Quarter 2013 Carbon Canister Report.....	Appendix 8.a
4 <sup>th</sup> Quarter 2013 Carbon Canister Report.....	Appendix 8.b
2nd Half 2013 Unsafe to Monitor Canister Report .....	Appendix 8.c
Benzene Waste NESHAP Audit Reporting.....	Appendix 9
Benzene Waste NESHAP Training Reporting .....	Appendix 10

## Section I: Semi-Annual Part VIII Report

### **Reporting and Recordkeeping – CD ¶ 98.**

On or before February 15 and August 15 each year, BPP shall submit to EPA and IDEM a semi-annual report as provided in this Part. Each semi-annual report shall contain the following information for the previous six month period (*i.e.*, January to June to be addressed in the report to be submitted by August 15, and July to December to be addressed in the report submitted by February 15).

A detailed response, meeting the Part VIII reporting requirements delineated in ¶ 98 are outlined in the section below.

### **Summary of Emissions – CD ¶ 98.a.**

..... For the period covered by the report, a summary of the emissions data for the Whiting Refinery that is specifically required by the reporting requirements of the Consent Decree for the period covered by the report.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

### **NOx emissions for each heater and boiler > 40 mmBtu/hr – CD ¶ 99.a.**

..... NOx emissions in tons per year for each heater and boiler greater than 40 mmBTU/hr maximum fired duty.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

### **Sum of NOx emissions for all heaters and boilers < 40 mmBtu/hr – CD ¶ 99.b.**

..... NOx emissions in tons per year as a sum for all heaters and boilers less than 40 mmBTU/hr maximum fired duty.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

### **SO<sub>2</sub>, CO and PM emissions for all heaters and boilers – CD ¶ 99.c.**

..... SO<sub>2</sub>, CO and PM emissions in tons per year as a sum for all heaters and boilers.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

### **SO<sub>2</sub> Emissions from the Sulfur Recovery Plant– CD ¶ 99.d.**

..... SO<sub>2</sub> emissions from the Sulfur Recovery Plant in tons per year.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**SO<sub>2</sub> emissions from all Acid Gas Flaring and Tail Gas Incidents by flare – CD ¶ 99.e.**

..... SO<sub>2</sub> emissions from all Acid Gas Flaring and Tail Gas Incidents by flare in tons per year.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**NO<sub>x</sub>, SO<sub>2</sub>, PM and CO emissions for all other units – CD ¶ 99.f.**

..... NO<sub>x</sub>, SO<sub>2</sub>, PM and CO emissions in tons per year as a sum for all other emissions units for which emissions information is required to be included in the facilities' annual emissions summaries and that are not identified above.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**NO<sub>x</sub>, SO<sub>2</sub>, CO and PM emissions for each FCCU – CD ¶ 99.g.**

..... NO<sub>x</sub>, SO<sub>2</sub>, CO and PM emissions in tons per year for each FCCU.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**Emissions from Covered Flares and the LPG Flare – CD ¶ 99.h.**

..... Emissions from Covered Flares and the LPG Flare as specified in Paragraph 73 of Appendix D.

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**Basis for the emissions estimate – CD ¶ 99.i.**

..... For each of the estimates or calculations in Subparagraphs 99.a through 99.h above, the basis for the emissions estimate or calculation (*i.e.*, stack tests, CEMS, emission factor, etc.).

This requirement is not due in this reporting period. Consent Decree ¶99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

**Description of any problems – CD ¶ 98.b.**

..... A description of any problems that have occurred or are anticipated with respect to meeting the requirements of this Consent Decree at the Whiting Refinery.

There have been no significant problems in meeting the requirements of this Consent Decree for this reporting period, and, at the present time, no such problems are anticipated.

**Description of Supplemental Environmental Project – CD ¶ 98.c.**

..... A description of the Supplemental Environmental Project and implementation activity in accordance with this Consent Decree.

The Fence Line Monitoring Supplemental Environmental Project (SEP) update includes the following:  
**Summary of implementation activity** - All four monitoring shelter locations were identified with input from the Community Advisory Committee (CAC) on July 2, 2012 as well as the U.S. EPA on August 16, 2012. A Quality Assurance Project Plan (QAPP) was completed and submitted on December 20, 2012, pursuant to Appendix E of the Consent Decree. All four monitoring shelter sites are on site and have been installed, with mechanical completion at three of the sites during this reporting period.

**Monitoring Instrument/Equipment Downtime – CD ¶ 98.d.**

..... The information specified in Paragraph 72 of Appendix D (“Monitoring Instrument/Equipment Downtime; Override of ACS; and Emissions Exceedances”)

BPP’s response to CD App.D.72.a. – 72.h for information pertaining to Monitoring Instrument/Equipment Downtime; Override of ACS; and Emissions Exceedances for this reporting period are below. The South and LPG flares are the only flares in operation to which the requirements of Paragraph 72 apply.

**Downtime of each monitoring instrument for the Covered Flare and the LPG Flare – CD App.D.72.a.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... The total number of hours of downtime of each monitoring instrument/equipment expressed as both an absolute number and a percentage of time the Covered Flare and the LPG Flare that the instrument/equipment monitors is available for operation.

Below are tables listing the availability of the equipment required pursuant to App. D, Paragraphs 7 through 9, and 11 through 13, expressed as an absolute number and percentage of time for the third and fourth quarter.

**Third Quarter Availability**

Source	Monitored Parameter	Total Operating Hours <sup>a</sup>	Downtime	
			Hours	Percentage
Meteorological Station	Wind Speed	2,208.0	0.00	0.00%
	Ambient Temperature	2,208.0	0.00	0.00%
South Flare	Waste Gas Flow Meter	2,208.0	0.00	0.00%
	Waste Gas Temperature	2,208.0	0.00	0.00%
	Waste Gas Pressure	2,208.0	0.00	0.00%
	Waste Gas Molecular Weight	2,208.0	1.43	0.06%
	Total Natural Gas Flow Meter	2,208.0	0.65	0.03%
	Total Natural Gas Temperature	2,208.0	0.00	0.00%

Source	Monitored Parameter	Total Operating Hours <sup>a</sup>	Downtime	
			Hours	Percentage
	Total Natural Gas Pressure	2,208.0	0.00	0.00%
	Total Steam Flow Meter	2,208.0	0.00	0.00%
	Total Steam Temperature	2,208.0	0.00	0.00%
	Total Steam Pressure	2,208.0	0.00	0.00%
	Total Nitrogen Purge Flow Meter	2,208.0	0.00	0.00%
	Total Nitrogen Purge Temperature	2,208.0	0.00	0.00%
	Total Nitrogen Purge Pressure	2,208.0	0.00	0.00%
	Gas Chromatograph ("GC")	2,208.0	0.00	0.00%
	Video Camera	2,208.0	0.00	0.00%

#### Fourth Quarter Availability

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
Meteorological Station	Wind Speed	2,208.0	0.00	0.00%
	Ambient Temperature	2,208.0	0.00	0.00%
South Flare	Waste Gas Flow Meter	2,208.0	20.1	0.91%
	Waste Gas Temperature	2,208.0	0.00	0.00%
	Waste Gas Pressure	2,208.0	0.00	0.00%
	Waste Gas Molecular Weight	2,208.0	0.95	0.04%
	Total Natural Gas Flow Meter	2,208.0	0.00	0.00%
	Total Natural Gas Temperature	2,208.0	0.00	0.00%
	Total Natural Gas Pressure	2,208.0	0.00	0.00%
	Total Steam Flow Meter	2,208.0	0.00	0.00%
	Total Steam Temperature	2,208.0	0.00	0.00%
	Total Steam Pressure	2,208.0	0.00	0.00%
	Total Nitrogen Purge Flow Meter	2,208.0	0.00	0.00%
	Total Nitrogen Purge Temperature	2,208.0	0.00	0.00%
	Total Nitrogen Purge Pressure	2,208.0	0.00	0.00%
	Gas Chromatograph ("GC")	2,208.0	0.00	0.00%
	Video Camera	2,208.0	0.00	0.00%

During two (2) flaring events in the fourth quarter at the South Flare, the waste gas flow meter returned flow values that were not believed as the flow was below the low flow cutoff point of the meter. Flow readings were substituted with values based on other flow meters and engineering judgment. The

timing associated with the data substitution represents the downtime associated with the waste gas flow meter for the fourth quarter.

**Identification of the periods of downtime by date, time, cause for downtime > 110 hours per calendar quarter – CD App.D.72.b.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... If the total number of hours of downtime of any monitoring instrument/equipment exceeds 110 hours in any calendar quarter, an identification of the periods of downtime by date, time, cause (including malfunction or maintenance), and, if the cause is asserted to be a Malfunction, the corrective action taken.

The downtime listed for App.D.72.a did not exceed 110 hours for any instrument.

**Number of hours when the Automatic Control System was overridden – CD App.D.72.c.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... The total number of hours in which BPP overrode the Automatic Control System expressed as both an absolute number of hours and a percentage of time the Covered Flare and the LPG Flare was available for operation.

The South Flare was overridden for a total of 36.1 hours. Per Appendix D Paragraphs 72.c and 51, approximately 10.7 hours of override were associated with the system being switched to manual as a result of a malfunction at an instrument required for compliance. No exception from Appendix D Paragraph 31 applies during any of the South Flare downtime. The LPG Flare was not overridden for any time, for any reason, during its operation.

Flare	Total Operating Hours <sup>a</sup>	Override Hours	Percent Override Hours
South Flare	4,416.0	36.1	0.82%
LPG Flare	1,295.5	0.0	0.00%

<sup>a</sup> LPG Flare started on November 6, 2013 at 9:50 am.

**Identification of the periods of downtime by date, time, cause for override time > 110 hours per calendar quarter – CD App.D.72.d.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... If the reason for the override was not one of the exceptions set forth in Paragraphs 31 or 45 or if the total number of hours in which the Automatic Control System was overrode exceeds 110 hours in any calendar quarter, an identification of the periods of override by the date, time, duration, reason for the override, and corrective actions taken

The control override time listed for App.D.72.c did not exceed 110 hours.

**Number of hours when only Pilot Gas or Purge Gas was vented – CD App.D.72.e.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... The total number of hours in which the only gas or gases being vented was/were

Pilot Gas and/or Purge Gas, expressed as both an absolute number of hours and a percentage of time the Covered Flare and/or the LPG Flare was available for operation.

Below is a table listing the total operating time as well as the hours when only pilot and purge were vented to the South and LPG flares.

Flare	Total Operating Hours <sup>a</sup>	Operating Only on Pilot and/or Purge Gas	
		Hours	Percent
South Flare	4,416.0	4,396.3	99.55%
LPG Flare	1,295.5	0	0%

<sup>a</sup> LPG Flare started on November 6, 2013 at 9:50 am

**Number of hours of exceedances of the applicable standards during Hours of Applicability – CD App.D.72.f.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... During the Hours of Applicability, the total number of hours of exceedances of the standards expressed as both an absolute number of hours and a percentage of time the Covered Flare and the LPG Flare was available for operation; provided however, that if the exceedance of these standards was less than 110 hours in the calendar quarter and was due to one or more of the exceptions set forth in Paragraph 51, the report shall so note.

The standards in Paragraphs 33.b, 34.a, 34.b, and 36 were not effective during this reporting period. Following is a table when the LPG Flare did not meet the air ratio requirement of Paragraph 45. The total operating time represents the entire time between November 6, 2013, the applicability date, and December 31, 2013, in which the flare received waste gas. The hours listed below represent short duration periods when the hourly average air ratio is greater than 10. This occurs when flow to the flare and the required air are at a minimum, causing the ratio to increase. The total time for the quarter was less than 110 hours.

Flare	Total Operating Hours <sup>a</sup>	Paragraph 45 Exceedance (Air Ratio)	
		Hours	Percent
LPG Flare	1,295.5	82.00	6.33%

<sup>a</sup> LPG Flare started on November 6, 2013 at 9:50 am.

**Identification of each averaging period that exceeded the standard during the Hours of Applicability – CD App.D.72.g.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... During the Hours of Applicability, if the exceedance of the standards was not due to one of the exceptions in Paragraph 51, or if the exceedance was due to one or more of the exceptions in Paragraph 51 but the total number of hours caused by the exceptions in Paragraph 51 was greater than 110, an identification of each averaging period that exceeded the standard, by time and date; the cause of the exceedance (including startup, shutdown, maintenance, or Malfunction), and if the cause is asserted to be a Malfunction, an explanation and any corrective actions taken.

The standards in Paragraphs 33.b, 34.a, 34.b, and 36 were not effective during this reporting period. The requirement in Paragraph 45 was not exceeded for more than 110 hours, but was not due to any of the exceptions in Paragraph 51.

**Flaring Limitations Exceedances – CD App.D.72.h.**

..... BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter..... Flaring Limitations Exceedances

The flaring limitations in Paragraphs 26 and 27 were not effective during this reporting period.

**Additional matters – CD ¶ 98.e.**

..... Any additional matters as BPP believes should be brought to the attention of EPA and IDEM

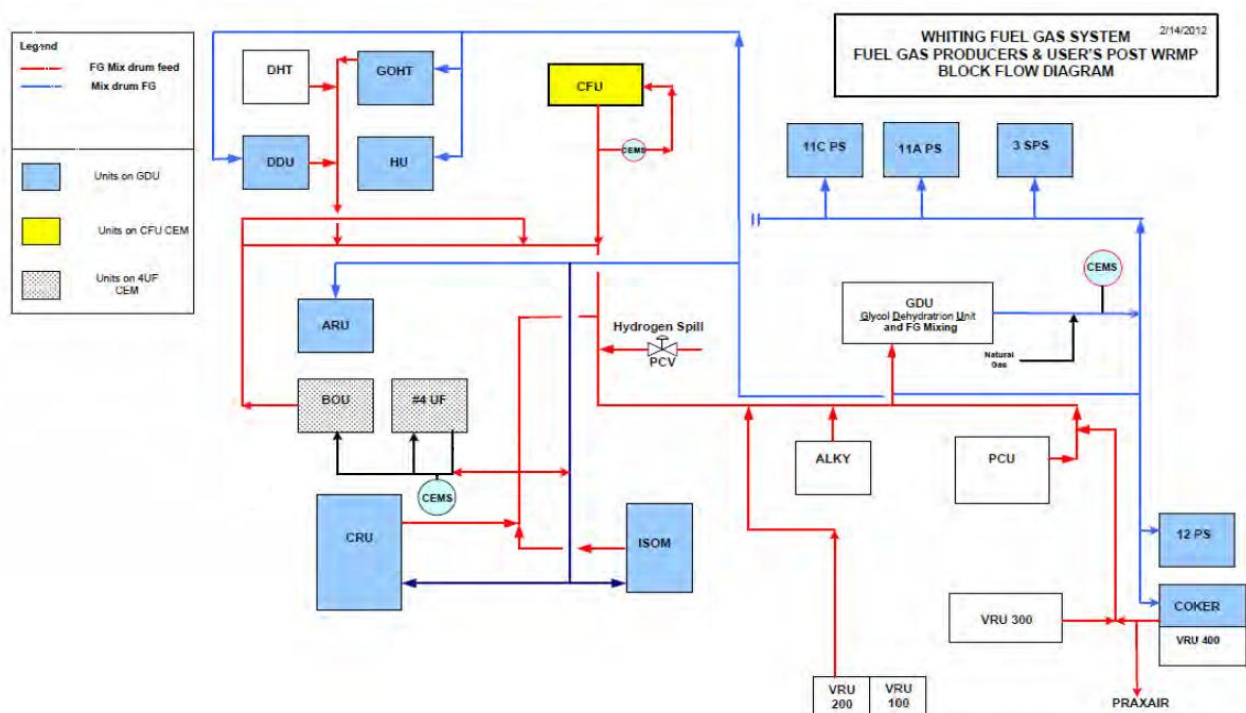
BPP submitted a letter to DOJ on June 7, 2013, Appendix 1, discussing issues arising under the Whiting Consent Decree; however, BPP has not been contacted with any responses to the issues raised. In addition, we submitted the following additional items in previous Semi-Annual Part VIII reports:

- Equation 6 in FLR-15 of Appendix D for air-assisted flares has the wrong constant. The constant should be 10 rather than 106.

$$\dot{m}_{air-assist} < 106 \cdot \dot{m}_{air-stoich-vg}$$

- The citation in Paragraph 61.a of the Consent Decree regarding BPP's ability to claim that heat exchange systems are not in organic HAP service should be 40 C.F.R. § 63.641 rather than 40 C.F.R. § 63.654(b)(2).
- Pursuant to 40 CFR Part 60, NSPS Subpart Ja, § 60.103a(b), BP Products North America, Inc. - Whiting Business Unit (WBU) submitted two (2) Flare Management Plans (FMPs) for its newly constructed South and GOHT Flares on March 27, 2013, and July 5, 2013, respectively. Each FMP contained the information required pursuant to § 60.103a(a) and each FMP was submitted prior to startup as required by § 60.103a(b)(1).
- Appendix A in the Consent Decree shows the wrong location for the fuel gas total sulfur monitors. The corrected figure is included below:

**APPENDIX A**  
**LOCATION OF FUEL GAS SULFUR MONITORS**



The following items are being newly submitted as additional items under ¶ 98.e:

- During 2013 FCCU 500 and FCCU 600 stack tests, both FCCUs demonstrated VOC emissions that were less than half of the applicable VOC emissions limit, thereby allowing BPP to elect to conduct VOC stack tests at least once every three (3) years in lieu of annual VOC stack testing as stated per CD ¶ 30.c.i.
- During the week of December 9, 2013 BPP performed particulate emissions testing at FCU600 to demonstrate compliance with the limits in Paragraph 18.b of the consent decree. Immediately following this testing, BPP determined that there were temporary, short-term abnormalities in the operation of the ammonia injection system that may have contributed to elevated condensable particulate levels during this testing. On December 19, 2013, BPP made process adjustments to correct those abnormalities. Upon receiving the results of this testing, BPP determined that emissions of PM10 measured during the test periods were in excess of the Paragraph 18.b.i limit on PM10, which became effective on December 31, 2013. BPP believes that the process adjustments made prior to the effective date of the PM10 limit reduced PM10 emissions below the level of the limit. To confirm this, BPP scheduled a new stack test for the week of February 17th, 2014. FCU600 is scheduled to begin a unit turnaround later in the first quarter of 2014. If, during the week of February 17th, BPP is not able to meet all of the Paragraph 21.a.iv test validity criteria, BPP will retest FCU600 promptly after the unit is restarted from turnaround.

**Additional items required by the Consent Decree – CD ¶ 98.f.**

..... Any additional items required by any other Paragraph of this Consent Decree to be submitted with a semi-annual report.

The additional items required by the Consent Decree to be submitted for this reporting period, including information from Consent Decree Paragraphs 42(a), 48(c), 52, 67, 69(c)(ii), 75, 91, 100, 101, Appendix B.38(c), Appendix D.3, Appendix D.20, Appendix D.35(a), Appendix D.42(d), Appendix D.43, Appendix D.49(c), Appendix D.57, and Appendix D.73, can be found below.

**Fuel Gas Total Sulfur Monitor Location – CD ¶ 42.a.**

..... If BPP changes the location of any of [the fuel gas total sulfur] monitors, BPP shall notify EPA and submit a revised Appendix A showing the new locations in the next report required by Part VIII.

BPP is required to install the fuel gas total sulfur analyzers by December 31, 2013. BPP did not make any changes to the location of any analyzer during the period covered by this report.

**CEMS Root Cause Failure Analysis – CD ¶ 48.c.**

..... For any CEMS having a downtime greater than 5% of the total time for each of two consecutive calendar quarters, BPP shall conduct a CEMS Root Cause Failure Analysis and develop a corrective action plan to promptly address the findings of the CEMS Root Cause Failure Analysis. ... The findings of the CEMS Root Cause Failure Analysis and corrective action plan, including a schedule for implementation, shall be submitted to EPA in a written report included with the first semi-annual report required by Part VIII of the Consent Decree following completion of the Root Cause Failure Analysis.

No CEMS had downtime greater than 5% for more than one (1) calendar quarter during the period covered by this report.

**Dual Carbon Canisters – CD ¶ 52.a.ii.**

..... BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

The unsafe to monitor canisters during the reporting period are provided in Appendix 8.c

**Single Carbon Canisters – CD ¶ 52.b.ii.**

..... BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

The unsafe to monitor canisters during the reporting period are provided in Appendix 8.c

**Single Carbon Canister Replacement – CD ¶ 52.b.iv.**

..... BPP shall notify EPA of such replacement in its next semi-annual ~~quarterly~~ report submitted pursuant to Part VIII of the Consent Decree.

BPP has completed the replacement of the single carbon canisters with dual carbon beds during this reporting period. A table is provided in the text of the BWON Semiannual report in section II CD ¶ 62.b.i. The table lists the locations of the dual-bed canisters, the dates switched from the single canisters or dual canisters and the dates in operation.

**Alternate Control/Treatment Devices for BWON – CD ¶ 52.c.**

..... If BPP elects to use another control technology, BPP shall submit written notification to EPA in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree providing both the location where such other control technology shall be used instead of or in addition to carbon adsorption and a description of the other technology to be used.

BPP did not elect to use an alternative control technology instead of or in addition to carbon adsorption during this reporting period.

**SRP O&M Plan Modifications – CD ¶ 67.c.**

..... BPP may make reasonable modifications to the SRP O&M Plan submitted under this Paragraph, provided that BPP provides EPA with a copy of the modification in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree.

BPP submitted an SRP O&M Plan under ¶ 67.b on December 19, 2012. No subsequent modifications were made to this plan.

**SRP Sulfur Storage Tanks – CD ¶ 69.c.**

..... For a period of one year commencing from the first use of each molten sulfur storage tank, BPP shall monitor on a continuous basis and report to EPA on a semi-annual basis the duration of all relief valve releases from each molten sulfur storage tank.

Tank 315 went into service on June 28, 2013 and Tank 316 went into service on July 13, 2013. Below is a summary of all valve releases from each tank during this reporting period:

Tank	Date	Duration of Release
Tk-315	July 11, 2013	1 minute
Tk-316	November 19, 2013	3 minutes

**FLIR Monitoring Inspections and Corrective Actions – CD ¶ 75.**

..... If imaging indicates emissions inconsistent with well-maintained floating roof tanks, seals, fittings, or welds, BPP shall inspect and, if necessary, repair the leaks consistent with the underlying Federal, State or local regulations applicable to the tank(s). BPP will report the results of these inspections and any corrective actions required during the next semi-annual Part VIII report.

Following are the inspection results for the tanks identified in Paragraph 75 with the corresponding corrective actions taken:

<b>Tank</b>	<b>Inspection Date</b>	<b>Inspection Results</b>	<b>Corrective Actions</b>
TK-5052	December 8, 2013	No leaks observed from the roof support legs, hatches, and rim seals. Leaks from 4 of 8 vacuum breakers were observed.	The leaking vacuum breakers identified by the FLIR camera were repaired by January 22, 2014.
TK-101	December 9, 2013	No leaks observed from the roof support legs, hatches, and rim seals.	N/A
TK-102	December 9, 2013	No leaks observed from the roof support legs, hatches, and rim seals.	N/A
TK-103	December 9, 2013	No leaks observed from the roof support legs, hatches, and rim seals.	N/A
TK-104	December 9, 2013	No leaks observed from the roof support legs, hatches, and rim seals.	N/A
TK-3559	Not In Service		
TK-3560	Not In Service		
TK-6254	December 8, 2013	No leaks observed from the roof support legs, hatches, and rim seals. Emissions observed from vent.	Operational controls were implemented to address the emissions observed from the tank vent by January 22, 2014.

**SEP Implementation Progress – CD ¶ 91.**

..... the report required by Paragraph 98.c. for the period in which the SEP is completed shall contain the following information with respect to the SEP (“SEP Completion Report”): a detailed description of the SEP as implemented, a description of any problems encountered in completing the SEP and the solutions thereto, an itemized list of all eligible SEP costs expended, certification that the SEP has been fully implemented pursuant to the provisions of this Decree, and a description of the environmental and public health benefits resulting from implementation of the SEP (with a quantification of the benefits and pollutant reductions, if feasible)

(a) a detailed description of the SEP as implemented;

(b) a description of any problems encountered in completed the SEP and the solutions thereto;

(c) an itemized list of all eligible SEP costs expended;

(d) certification that the SEP has been fully implemented pursuant to the provisions of this Decree; and

(e) a description of the environmental and public health benefits resulting from implementations of the SEP (with a quantification of the benefits and pollutant reductions, if feasible).

The Fence Line Monitoring SEP was not completed in this reporting period.

**Emissions limit exceedance for units monitored by CEMS – CD ¶ 100.a.**

..... BPP will provide a summary of all exceedances..... For operating unit emissions limits that are required by this Consent Decree and monitored with CEMS, for each CEMS.

Appendix 2a and Appendix 2b include the 3<sup>rd</sup> and 4<sup>th</sup> Quarter 2013 CEM Summary Performance Report submitted to IDEM, respectively. These reports include all the information required by CD ¶ 100.a.i. – ¶ 100.a.v.

**Emissions limit exceedance for units monitored by stack testing – CD ¶ 100.b.**

..... BPP will provide a summary of all exceedances..... For any exceedance of an emissions limit required by this Consent Decree from an operating unit monitored through stack testing.

There were no emission limit exceedances from units required under the Consent Decree to be monitored by stack testing during this reporting period.

**Results of performance testing on both FCCU units – CD ¶ 101.a.**

..... BPP shall include in each semi-annual report required by this Part VIII the results of all testing of FCU 500 and FCU 600 required by Paragraph 21 (“FCCU Performance Testing”).

The FCU 500 and FCU 600 Performance Testing results from this reporting period are included in Appendices 3a and 3c, and Appendix 3b, respectively.

**Copies of all reports required by NSPS Ja – CD ¶ 101.b.**

..... BPP shall include in each semi-annual report copies of all applicable reports required by 40 C.F.R. § 60.108a for the previous 6-month period.

BPP has included all the information required by NSPS Ja in the CEM Summary Performance Reports included in Appendix 2a and Appendix 2b of this semi-annual report.

**Copies to Citizen-Intervenor of all reports of emission testing– CD ¶ 101.c.**

..... Concurrent with submission to EPA, BPP shall submit copies to Citizen-Intervenor of all reports of emissions testing required by this Paragraph.

BPP is submitting copies of Appendices 3a, 3b, and 3c to Citizen-Intervenor concurrent with the submission of this semi-annual report.

**Commercial Unavailability of Low-Leaking Valve or Packing Technology – CD App.B.38(c)**

..... BPP shall prepare a written report fully explaining the basis for each claim that a valve or valve packing is not commercially available, to include all relevant documentation and other information supporting the claim. Such report shall also identify the commercially-available valve or packing technology that comes closest to meeting the requirements for a Certified Low-Leaking Valve or Certified Low-Leaking Valve Packing Technology that is selected and installed by BPP pursuant to Paragraph 19 of this Appendix. Such report shall be included in the Semi-Annual Report required by Section VIII of the Consent Decree, for the period in which the valve or valve packing is replaced...

Attached, in Appendix 4, are reports for the two valves in hydrocarbon service that BPP have identified as commercially unavailable, pursuant to Appendix B Paragraph 20.a, during the reporting period. In addition to the attached documentation, below is supplemental information as required in Appendix B, Paragraph 38.

For the two valves determined to be commercially unavailable, McJunkin, the valve supplier for BPP, determined that only one manufacturer for this type of specialty valves exist. This is detailed in the Appendix 4 supporting documentation.

McJunkin and BPP Valve Technical Authority are not aware of any commercially available valves that meet the Certified Low-Leaking Valve requirement for this type of specialty valve.

**Minimizing Sweep and Purge Gas Flow – CD App.D.3**

..... Based on the results of the survey, by no later than one year after the Date of Entry, BPP shall complete the implementation of all measures necessary to minimize the amount of Sweep Gas and Purge Gas being directed to each Covered Flare. If the implementation of any such measure takes longer than one year after the Date of Entry, BPP shall complete the implementation as soon as practicable and shall provide a schedule for such completion in the first semi-annual report under Section VIII of this Decree that is due after one year after the Date of Entry..

An initial field walkdown was performed to inventory and identify condition and operating set point of all refinery rotometers providing purge/sweep gas to the Covered Flares. The initial operating set points were used to define existing base sweep/purge at each flare. Minimum sweep/purge was defined for each flare using standard engineering calculations or information from the flare tip vendor:

- a) To prevent air ingress into the flare stack due to wind diffusion or buoyancy effects.

- b) To prevent flashback inside the flare tip.

The refinery has upgraded all existing broken and unreliable rotameters and standardized flowrate from all new rotameters delivering purge/sweep gas to meet minimum sweep/purge flow . Where rotameters were not applicable for use, orifice plates were installed to deliver a constant flow verified with engineering calculations. All rotameters on the GOHT and SOUTH flares were designed new and installed prior to flare start-up to provide a minimum flare purge for sweep gas only, not thermal contraction, since these systems have a flare seal drum intact to passively protect for this scenario. Routine operator rounds were developed to ensure purge/sweep gas is maintained at the minimum level.

**Waste Gas Minimization Plan – CD App.D.20.**

..... In the first semi-annual report required under Part VIII that is due after June 30, 2017, BPP shall submit a Second Updated WGMP. On an annual basis thereafter until termination of the Decree, BPP shall submit an updated WGMP as part of the applicable semi-annual report...

This reporting requirement was not effective during this reporting period.

**Prohibition on Discontinuous Wake Dominated Flow or Requirement for Minimum MFR – CD App.D.35.a**

..... By no later than December 31, 2014, for all Covered Flares, BPP shall comply with either Subparagraph 35.b. or 35.c. In the first semi-annual report due after the applicable compliance date, BPP shall identify which compliance option it selects for each Covered Flare.

This reporting requirement was not effective during this reporting period.

**LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.42.d**

..... In the semi-annual report required under Paragraph 98 of Part VIII that is the first one due after one year after the Date of Entry of this Consent Decree, provide a detailed description of the installations made in compliance with Subparagraphs 42.a. and 42.b, including the specific models and manufacturers.

BPP has made the following installations of instrumentation and monitoring systems at the LPG Flare:

Instrument	Manufacturer	Model
Waste Gas Flow Meter	Fluenta	FGM 160
Air Blower and Motor	Allen-Bradley	PowerFlex 755

The automatic control system consists of the waste gas flow meter and air blower. The flow reading from the meter, along with the equations from Appendix FLR-15, are used to determine the amount of air required to meet the stoichiometric air ratio. The ratio used by the control system is based on a manual setpoint that the system targets. The control system uses the setpoint to target the air ratio and adjusts the speed of the air blower appropriately.

**Waste Gas Minimization for LPG Flare – CD App.D.43**

..... In the first semi-annual report due after the installation of the flow meter required pursuant to Subparagraph 42.a and continuing through the semi-annual report due in January of 2015, BPP will provide, for the time period covered by the semi-annual report, the following information: (i) the volumetric flow of Waste Gas, in scfm, on a 30-day rolling average, and the mass flow rate, in pounds per hour, on a 30-day rolling average, vented to the LPG Flare; (ii) the Prevention Measures implemented for the reporting period; and (iii) the Prevention Measures expected to be implemented in the future, together with a schedule for prompt implementation..

The flow information requested by this paragraph is included in Appendix 5. It should be noted that the 30-day rolling averages begin on December 5, 2013, which is 30 days after the LPG Flare flow meter became operational. There were no specific prevention measures implemented for the time period. Nevertheless, prevention measures for the future are anticipated after a waste gas minimization assessment is conducted in early 2014.

**LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.49.c**

..... If as a result of an annual review of the annual average Vent Gas Flow Rate for the LPG Flare, BPP is not required to conduct Passive FTIR Testing, BPP shall report the results of the annual review in the first semi-annual report that is due after the annual review has been completed. If as a result of an annual review, BPP is required to conduct Passive FTIR Testing, BPP shall notify EPA by no later than April 30 of the applicable year of the results of the review and the schedule that it will follow to comply with the requirements in Subparagraphs 48.a and 48.b.

This reporting requirement was not effective during this reporting period.

**Submitting the Internal Flaring Incident reports – CD App.D.57**

..... In each semi-annual report due under Part VIII of this Consent Decree, BPP shall include copies of each Reportable Flaring Incident report that BPP was required to prepare in compliance with Paragraph 54 during the six month period that the semi-annual report covers ...

Event reports addressing the requirements of Paragraphs D.57.a – f for the four hydrocarbon flaring incidents that occurred during this reporting period are contained in Appendix 6a – 6d.

**Submitting the Internal Flaring Incident reports – CD App.D.57.g**

..... Stipulated penalties, if any, due ...

There were no acid gas flaring incidents during this reporting period.

**Submitting the Internal Flaring Incident reports – CD App.D.57.h**

..... An analysis of any trends identified by BPP in terms of the number of Incidents, the Root Causes or the types of Corrective Action ...

There were several hydrocarbon flaring incidents during 2013 involving start up or shut down of new major process units. However, each of these events was determined to be somewhat unique, and identified different corrective actions to implement to prevent their re-occurrence.

**VOC, SO<sub>2</sub>, H<sub>2</sub>S, CO<sub>2</sub>, methane, and ethane emissions for each Covered Flare and the LPG Flare – CD App.D.73**

..... BPP shall provide, for each Covered Flare and the LPG Flare, for the prior calendar year, the amount of emissions of the following compounds (in tons per year): VOCs, SO<sub>2</sub>, H<sub>2</sub>S, CO<sub>2</sub>, methane, and ethane.

This requirement is not due in this reporting period. It is due in the semi-annual report to be submitted by August 15 of each calendar year.

## Section II: Semi-Annual Benzene Waste NESHAP Report

### **Semi-Annual Benzene Waste NESHAP Report – CD ¶ 62.**

..... BPP shall submit a semi-annual report to EPA that includes the following information for the Whiting Refinery regarding compliance with the Benzene Waste NESHAP requirements of this Section (the “Semi-Annual Benzene Waste NESHAP Report”). Each Semi-Annual Benzene Waste NESHAP Report shall include the following information for the two most recently completed Calendar Quarters (the “reporting period”).

Further, more detailed responses for ¶ 62 are given below.

### **EOL Report CD ¶ 62.a.i (1)**

..... BPP shall submit...a list of waste streams sampled at Whiting Refinery pursuant to Paragraph 58.

### **EOL Report CD ¶ 62.a.i (2)**

..... BPP shall submit...the results of the quarterly and annual sampling conducted pursuant to Paragraph 58, including the results of the benzene analysis for each sample.

The table below identifies the waste streams sampled pursuant to Paragraph 58 and the results for those samples. These sampling results include:

- 1) all “end-of-line” (EOL) samples taken pursuant to CD ¶ 58.a as part of the quarterly samples required under the current EOL Sampling Plan
- 2) all samples taken pursuant to CD ¶ 58.c that count toward the 6 Mg compliance limit and contain greater than 0.05 Mg/yr of benzene.

Waste Stream**	Sampling Date	Quarterly Benzene (ppm) 58.a	Annual Benzene (ppm) 58.c
Tank 908 Lift Station - Water Phase*	7/9/13	0.1	
Tank 908 Lift Station - Water Phase*	10/9/13	0.015	
East French Drain - Water Phase*	7/9/13	0.018	
East French Drain - Water Phase*	10/9/13	0.016	
West French Drain - Water Phase*	7/9/13	0.002	
West French Drain - Water Phase*	10/9/13	0.0027	
Indiana Tank Field - Oil Phase	10/9/13	5.9	
Indiana Tank Field - Water Phase*	7/9/13	0.09	

Waste Stream**	Sampling Date	Quarterly Benzene (ppm) 58.a	Annual Benzene (ppm) 58.c
Indiana Tank Field - Water Phase	10/9/13	0.048	
J&L Separator	7/9/13	0.022	
J&L Separator	10/9/13	0.00042J	
Lake George Remediation Groundwater	7/9/13	0.52	
Lake George Remediation Groundwater	10/9/13	0.47	
Marketing Terminal - Water Phase*	7/9/13	0.035	
Marketing Terminal - Water Phase*	10/9/13	0.039	
SRU T-401 Stripping Tower (3Q13)	Out of service	Not available	
SRU T-401 Stripping Tower (4Q13)	Out of service	Not available	
AFU (DAF) Flotation Material - Oil	7/9/13	120	
AFU (DAF) Flotation Material - Oil	10/9/13	98	
AFU (DAF) Flotation Material - Water	7/9/13	2.1	
AFU (DAF) Flotation Material - Water	10/9/13	1.4	
AFU (DAF) Flotation Material - Sludge	7/9/13	18	
AFU (DAF) Flotation Material - Sludge	10/9/13	13	
Remediation Groundwater J-141A	7/9/13		6.0
Remediation Groundwater J-141A	10/9/13		4.9
Remediation Groundwater J-157	7/9/13		0.51
Remediation Groundwater J-157	10/9/13		0.4
Petroleum Contaminated Soil (13 samples taken)	Sep-Nov 2013	<0.013	
Petroleum Contaminated Soil	7/3/13	<0.05	
Petroleum Contaminated Soil	9/13/13	1.0	
Petroleum Contaminated Soil	12/19/13	0.13	
Petroleum Contaminated Soil	10/28/13	0.085	
Lead Contaminated Soil	10/18/13	<0.063	
Petroleum Contaminated Debris	10/18/13	0.027.	
Petroleum Contaminated Debris	11/1/13	<0.062	
Petroleum Contaminated Debris	12/13/13	0.054	
Centrifuge Cake	9/19/13	8.2	
Spent Catalyst (Non-Listed Waste) - 5 samples taken	Oct - Nov 2013	ND (<0.013)	
Spent Catalyst (Non-Listed Waste)	11/27/13	ND (<0.05)	
Spent Catalyst (Non-Listed Waste)	12/15/13	1.5	
Spent Catalyst (Non-Listed Waste)	12/16/13	1.6	

Spent Catalyst (Non-Listed Waste)	12/17/13	1.4	
Spent Catalyst (Non-Listed Waste)	12/19/13	1.5	
Spent Catalyst (Non-Listed Waste)	12/19/13	1.7	
Spent Catalyst (Non-Listed Waste)	12/19/13	1.8	
Tank Seals	7/12/13	370	
Centrifuge sludge	9/19/13	78	

\* = Denotes “sufficient oil volume available at the time to be sampled”

J = Denotes “not quantifiable”.

< = Denotes “the reporting value is less than the quantification limit”

\*\* This table does not include solid wastes that do not contribute to 6BQ.

**EOL Report CD ¶ 62.a.i (3)**

..... BPP shall submit...the computation of the EOL benzene quantity for each quarter.

The computation of the EOL benzene quantity for each quarter is determined by:

- 1) Multiplying the concentration of benzene in the waste stream sample by the total quarterly waste quantity for the waste stream. Where there are multiple sample results from any particular waste stream, these results are averaged for the computation. In cases where there is an associated organic phase with a waste stream that is known to exist, and a separate analytical result was not obtainable at the time of sampling, an estimate of the benzene concentration was assumed by a partitioning factor to be either, 100 times the results in the water phase concentration (based on industry rule of thumb), or that average of historic oil phase partitioning from when both water and oil sampling have occurred simultaneously (e.g. Tank 908 lift station).
- 2) Summing the benzene quantity from each waste stream.

### 3Q13 EOL Benzene Quantity\*

Waste Stream I.D.	Waste Stream Description	Waste Stream Flow (Mg/Qtr)	Benzene Concentration (ppmw)	Benzene Mass (Mg/Qtr)
001A <sup>(1)</sup>	Tank 908 Lift Station - Oil Phase	135.11	5.100	0.00069
001B	Tank 908 Lift Station - Water Phase	4,806.47	0.100	0.00048
001C	J&L Separator	124.67	0.022	0.00000
002A <sup>(1)</sup>	Indiana Tank Field - Oil Phase	246.58	9.000	0.00222
002B	Indiana Tank Field - Water Phase	10,444.11	0.090	0.00094
Based on 002A	South Tank Field - Oil Phase	167.67	9.000	0.00151
Based on 002B	South Tank Field - Water Phase	7,101.99	0.090	0.00064
003 <sup>(2)</sup>	SRU T-401 Stripping Tower	0.00	NA	0.00000
004 <sup>(3)</sup>	Lake George Remediation Groundwater	0.00	0.000	0.00000
005 <sup>(4)</sup>	Tank 5050	0.00	NA	0.00000
006A	#7Separator API Sludge	NA	NA	NA
006B	AFU (DAF) Flotation Material	8,838.79	26.212	0.23168
007	Tank BT 2 (Controlled in '09)	0.00	NA	0.00000
008	Waste Containers	39,427.88	1.767	0.06966
009A <sup>(1)</sup>	East French Drain - Oil Phase	0.00	0.000	0.00000
009B	East French Drain - Water Phase	3,973.42	0.018	0.00007
010A <sup>(1)</sup>	West French Drain - Oil Phase	30,848.94	0.200	0.00617
010B	West French Drain - Water Phase	0.00	0.000	0.00000
011A <sup>(1)</sup>	Marketing Terminal - Oil Phase	246.58	1.200	0.00030
011B	Marketing Terminal - Water Phase	10,444.11	0.012	0.00013

Total Uncontrolled Benzene: **0.314**

\* This table does not include the benzene quantity of the waste streams sampled pursuant to ¶ 58.c since those samples were not “end of line” samples.

- (1) Oil or water phase was not present during sampling.
- (2) Equipment was out of service in entire quarter
- (3) This source was sampled during this quarter; however, the waste stream is controlled.
- (4) Zero flow was recorded during the reporting quarter due to no impoundment events.

### 4Q13 EOL Benzene Quantity\*

Waste Stream I.D.	Waste Stream Description	Waste Stream Flow (Mg/Qtr)	Benzene Concentration (ppmw)	Benzene Mass (Mg/Qtr)
001A <sup>(1)</sup>	Tank 908 Lift Station - Oil Phase	7.71	0.765	0.00001
001B	Tank 908 Lift Station - Water Phase	806.12	0.015	0.00001
001C	J&L Separator	1,205.09	0.000	0.00000
002A <sup>(1)</sup>	Indiana Tank Field - Oil Phase	231.36	5.900	0.00137

002B	Indiana Tank Field - Water Phase	8,955.72	0.048	0.00043
Based on 002A	South Tank Field - Oil Phase	157.32	5.900	0.00093
Based on 002B	South Tank Field - Water Phase	6,089.89	0.048	0.00029
003 <sup>(2)</sup>	SRU T-401 Stripping Tower	0.00	NA	0.00000
004 <sup>(3)</sup>	Lake George Remediation Groundwater	0.00	0.000	0.00000
005 <sup>(4)</sup>	Tank 5050	0.00	NA	0.00000
006A	#7Separator API Sludge	NA	NA	NA
006B	AFU (DAF) Flotation Material	8,838.79	14.592	0.12897
007	Tank BT 2 (Controlled in '09)	0.00	NA	0.00000
008	Waste Containers	32,788.37	4.587	0.15040
009A <sup>(1)</sup>	East French Drain - Oil Phase	51.59	1.600	0.00008
009B	East French Drain - Water Phase	3,616.16	0.016	0.00006
010A <sup>(1)</sup>	West French Drain - Oil Phase	20,161.33	0.270	0.00544
010B	West French Drain - Water Phase	182.17	0.003	0.00000
011A	Marketing Terminal - Oil Phase	231.36	1.200	0.00028
011B	Marketing Terminal - Water Phase	8,955.72	0.012	0.00011

Total Uncontrolled Benzene: **0.288**

\* This table does not include the benzene quantity of the waste streams sampled pursuant to ¶ 58.c since those samples were not “end of line” samples.

- (1) Oil or water phase was not present during sampling.
- (2) Equipment was out of service in entire quarter
- (3) This source was sampled during this quarter; however, the waste stream is controlled.
- (4) Zero flow was recorded during the reporting quarter due to no impoundment events.

**EOL Report CD ¶ 62.a.i (4)**

..... BPP shall submit...any other related information required under a revised EOL Sampling Plan if submitted pursuant to Paragraph 58.

BPP has no other related information to submit.

**EOL Report CD ¶ 62.a.ii**

BPP shall use all sampling results and approved flow calculation methods pursuant to Paragraph 58 to calculate and report a quarterly and a calendar year uncontrolled benzene quantity for the Whiting Refinery against the 6 Mg Option.

BPP has used all sampling results and approved flow calculation methods pursuant to Paragraph 58 to calculate the quarterly and calendar year uncontrolled benzene quantity as follows.

**Calendar Year Summary**

- Paragraph 58c streams refer to uncontrolled waste streams exceeding 0.05 Mg/yr but not on the EOL sampling plan.
- Paragraph 58a streams refer to uncontrolled waste streams currently on the EOL sampling plan.

Sample Period	Results
2013 – Annual (§ 58.c streams) YTD	0.241 MG/YR
4Q2013 - EOL (§ 58.a streams)	0.288 Mg/Qtr
3Q2013 – EOL (§ 58.a streams)	0.314 Mg/Qtr
2Q2013 – EOL (§ 58.a streams)	0.196 Mg/Qtr
1Q2013 – EOL (§ 58.a streams)	0.509 Mg/Qtr
<b>Calendar Year-to-Date Total</b>	<b>1.549 Mg/yr</b>

#### **EOL Report CD § 62.a.iii**

..... If the quarterly uncontrolled benzene quantity (for any Calendar Quarter during the reporting period) at the Whiting Refinery exceeds 1.5 Mg or the annual uncontrolled benzene quantity exceeds 6 Mg, then BPP shall...conduct a Root Cause Failure Analysis and develop a corrective action plan...

The uncontrolled benzene quantity did not exceed 1.5 Mg for any calendar quarter. The annual uncontrolled benzene quantity for 2013 did not exceed 6.0 Mg.

#### **EOL Report CD § 62.a.iv**

BPP shall identify all labs used during the quarter to analyze benzene waste samples collected at the Whiting Refinery pursuant to this Section J, and BPP shall provide the date of the most recent audit of each lab.

The following labs have been used during the reporting period to analyze the benzene waste samples. The dates of most recent audit performed on these labs are also provided as follows.

Lab	Date of Most Recent Audit
Microbac Lab	11/14-11/15/2012
Test America Lab – Sacramento CA	9/19/2013
Test America Lab – University Park IL	9/17/2013

**Carbon Canister Report CD ¶ 62.b.i**

..... As part of the second Semi-Annual Benzene Waste NESHAP Report required by the Consent Decree, BPP shall submit a project completion report to EPA detailing the actions performed to comply with the requirements of Paragraph 52. BPP shall include a list of all locations within the refinery using the dual-canister option, the installation date of each such dual-canister, and the date that each dual-canister was put into operation.

Included in Appendix 7, BPP provides a project completion report to EPA detailing the actions performed to comply with the requirements of Paragraph 52.

The project to fulfill this requirement was completed by November 5, 2013. BPP has implemented the dual-bed carbon canisters as the standard carbon canister configuration throughout the refinery, except as provided under ¶ 52.b.i.(4) for carbon canisters 87 through 98 at the Lakefront wastewater treatment plant. This dual-bed configuration also applies to these locations where the dual bed carbon canisters or dual canisters are not required per Consent Decree ¶ 52.b.i.(1) to 52.b.i.(3). A table is provided in the text of the BWON Semiannual report in section II CD ¶ 62.b.i. The table lists the locations of the dual-bed canisters, the dates switched from the single canisters or dual canisters and the dates in operation.

^ = Denotes dual-bed carbon canister required by Consent Decree

\* = Denotes switched from dual-canisters configuration.

ID	Location	Date Installed	Date In Operation	ID	Location	Date Installed	Date In Operation
62	11PS	10/23/13	10/23/13	27^	FCU 500	9/18/13	9/18/13
63	11PS	10/23/13	10/23/13	28^	FCU 500	9/19/13	9/19/13
65	11PS	10/23/13	10/23/13	29^	FCU 500	9/19/13	9/19/13
60^	11PS	9/5/13	9/5/13	15	FCU 600	9/26/13	9/26/13
61^	11PS	9/6/13	9/6/13	16	FCU 600	9/26/13	9/26/13
66^	11PS	9/11/13	9/11/13	17	FCU 600	9/26/13	9/26/13
67^	11PS	9/6/13	9/6/13	18	FCU 600	9/26/13	9/26/13
68^	11PS	9/6/13	9/6/13	19^	FCU 600	10/3/13	10/3/13
69^	11PS	9/11/13	9/11/13	20^	FCU 600	9/3/13	9/3/13
71^	11PS	10/3/13	10/3/13	23^	FCU 600	9/4/13	9/4/13
72^	11PS	9/6/13	9/6/13	107^*	GOHT	9/24/13	9/24/13
73^	11PS	9/6/13	9/6/13	108^*	GOHT Flare	11/4/2013	11/4/2013
74^	11PS	9/6/13	9/6/13	2	LAB	10/24/13	10/24/13
75^	11PS	9/5/13	9/5/13	85^	LF	9/6/13	9/6/13
76^	11PS	9/6/13	9/6/13	86^	LF	9/6/13	9/6/13
35^ *	12PS	11/4/13	11/4/13	123^ (Duratherm)	LF	9/25/13	9/25/13
36^ *	12PS	11/4/13	11/4/13	105^	LF	11/5/13	OOS

101^	12PS	5/14/2013	5/21/2013	106^	LF	11/5/13	OOS
103^	12PS	5/14/2013	5/21/2013	110A^	LF	10/2/2013	10/9/2013
41	3UF	9/25/13	9/25/13	110B^	LF	10/2/2013	10/9/2013
46	4UF	10/24/13	10/24/13	111A^	LF	10/2/2013	10/9/2013
45^	4UF	9/6/13	9/6/13	111B^	LF	10/2/2013	10/9/2013
47^	4UF	9/4/13	9/4/13	124^	LF	10/2/2013	10/9/2013
109	Alky	10/21/13	10/21/13	112^ *	NSU	11/4/13	11/4/13
50	ARU	10/22/13	10/22/13	119^	OSBL	9/24/2013	10/1/2013
51	ARU	10/22/13	10/22/13	120^	OSBL	6/27/2013	7/4/2013
52	ARU	10/22/13	10/22/13	121^	OSBL	6/27/2013	7/4/2013
53	ARU	10/22/13	10/22/13	122^	OSBL	8/8/2013	8/15/2013
77	CFU	9/23/13	9/23/13	58	OSBL 2	10/28/13	10/28/13
78^	CFU	9/23/13	9/23/13	59	OSBL 2	10/28/13	10/28/13
114^	Coker2	9/24/2013	10/1/2013	37^	OSBL 2	9/6/13	9/6/13
115^	Coker2	9/24/2013	10/1/2013	38^	OSBL 2	9/6/13	9/6/13
116^	Coker2	9/24/2013	10/1/2013	39	OSBL 3	9/5/13	9/5/13
117^	Coker2	9/24/2013	10/1/2013	30^	OSBL 3	9/9/13	9/9/13
118	Coker2	9/24/2013	10/1/2013	32^	OSBL 3	9/24/13	9/24/13
42^	CRU	9/5/13	9/5/13	33^	OSBL 3	9/16/13	9/16/13
79^	DDU	9/10/13	9/10/13	56^	OSBL 3	9/11/13	9/11/13
80^	DDU	9/10/13	9/10/13	57^	OSBL 3	9/11/13	9/11/13
104^	DDU	5/7/2014	5/14/2013	83^	OSBL 5	9/6/13	9/6/13
<b>ID</b>	<b>Location</b>	<b>Date Installed</b>	<b>Date In Operation</b>	<b>ID</b>	<b>Location</b>	<b>Date Installed</b>	<b>Date In Operation</b>
82	DDU (flare)	9/9/13	9/9/13	84^	OSBL 6	9/6/13	9/6/13
99^	DHT	9/4/13	9/4/13	113^*	S Flare	11/4/2013	11/4/2013
11	FCU 500	9/25/13	9/25/13	5	VRU 100	9/25/13	9/25/13
25	FCU 500	9/25/13	9/25/13	6^	VRU 100	9/18/13	9/18/13
26	FCU 500	9/18/13	9/18/13	7^	VRU 100	9/18/13	9/18/13
13^	FCU 500	9/3/13	9/3/13	3	VRU 200	9/25/13	9/25/13
14^	FCU 500	9/3/13	9/3/13	4^	VRU 200	9/24/13	9/24/13
24^	FCU 500	9/4/13	9/4/13	34^	VRU 300	9/9/13	9/9/13

Note: The table above includes canisters that are not required for BWON compliance.

#### **Carbon Canister Report CD ¶ 62.b.ii**

..... As part of each Semi-Annual Benzene Waste NESHA Report, for all locations at which single carbon canisters are used, BPP shall identify each such location and provide the results of all breakthrough monitoring and carbon canister change-outs that occurred during the reporting period. For each single carbon canister, BPP shall also identify: i) the date(s) and approximate time when breakthrough was first detected; and ii) for each breakthrough event, the date and time when carbon canister change-out occurred. BPP shall also include in each semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

In 3rd quarter and 4th quarter of 2013, BPP was in the process switching over to dual-bed carbon canisters. The following table provides the locations of single carbon canisters prior to the completion of the dual-bed carbon canister project on November 5, 2013.

<b>ID</b>	<b>Location</b>	<b>ID</b>	<b>Location</b>
2	LAB	57	OSBL 3
3	VRU 200	58	OSBL 2
4	VRU 200	59	OSBL 2
5	VRU 100	60	11 PS
6	VRU 100	61	11 PS
7	VRU 100	62	11 PS
11	FCU 500	63	11 PS
13	FCU 500	65	11 PS
14	FCU 500	66	11 PS
15	FCU 600	67	11 PS
16	FCU 600	68	11 PS
17	FCU 600	69	11 PS
18	FCU 600	71	11 PS
19	FCU 600	72	11 PS
20	FCU 600	73	11 PS
23	FCU 600	74	11 PS
24	FCU 500	75	11 PS
25	FCU 500	76	11 PS
26	FCU 500	77	CFU
27	FCU 500	78	CFU
28	FCU 500	79	DDU
29	FCU 500	80	DDU
30	OSBL 3	82	DDU (flare)
32	OSBL 3	83	OSBL 5
33	OSBL 3	84	OSBL 6
34	VRU 300	85	LF
35	12 PS	86	LF
36	12 PS	87	LF
37	OSBL 2	88	LF
38	OSBL 2	89	LF
39	OSBL 3	90	LF
47	4 UF	91	LF
50	ARU	92	LF
51	ARU	93	LF
52	ARU	94	LF
53	ARU	95	LF
56	OSBL 3	96	LF
41	3 UF	97	LF
42	CRU	98	LF
45	4 UF	99	DHT
46	4 UF		

The single carbon canister breakthrough monitoring results during the 3rd and 4th quarters of 2013 are provided in Appendix 8a and Appendix 8b, respectively.

A list of all canisters or beds designated as unsafe to monitor during the reporting period is provided in Appendix 8c.

**Audit Reporting CD ¶ 62.c**

..... As part of each Semi-Annual Benzene Waste NESHAP Report, BPP shall identify all labs audited pursuant to the requirements of Paragraph 54 during the reporting period, and shall submit the results and the reports regarding any such audits. For each lab audited, BPP shall also provide a description of the methods used in the audit.

BPP audited the Test America Lab at University Park, IL on September 17, 2013 in this reporting period. The audit report is provided in Appendix 9a. BPP audited the Test America Lab at Sacramento, CA on September 19, 2013 in this reporting period. The audit report is provided in Appendix 9b. Both audit reports provide a description of the methods used in the audit in Section 2.

**Training Reporting CD ¶ 62.d**

..... As part of each Semi-Annual Benzene Waste NESHAP Report, BPP shall identify the employees who received training during the reporting period pursuant to the requirements of Paragraph 56, and shall describe the training these employees received. BPP shall also describe the training scheduled to be performed during the next reporting period.

**[CD ¶ 56.a] Waste Stream Sampling**

The employees with responsibility to sample benzene waste streams [CD ¶ 56.a] who received training during this reporting period are provided in Appendix 10 of this report.

Benzene NESHAP Waste Sampling training is scheduled throughout the year by means of computer based training (Virtual Training Assistant - VTA). Each employee takes the training on an annual basis depending upon their initial individual training schedule.

Benzene NESHAP waste sampling training is designed to review sampling procedures that minimize benzene loss during sampling. For example: 1) taking samples with minimum or no head space in sampling vials, 2) immediately cooling samples, 3) preserving samples on ice while waiting and in transport to the laboratory, 4) proper chain-of-custody procedures.

**[CD ¶ 56.b] Control Devices**

The employees with responsibility to operate control devices used to comply with Benzene Waste Operations NESHAP [CD ¶ 56.b] who received training during this reporting period are provided in Appendix 10 of this report:

Benzene NESHAP – NSPS QQQ SOP / SOP Refresher training is scheduled throughout the year by means of VTA. Each employee takes the training on an annual basis depending upon their initial individual training schedule.

This course provides brief overview of BWON and NSPS QQQ regulations. It also includes the standard operating procedure for inspecting and operating the waste management units (i.e., drains, cleanouts, manhole covers, conservation vents, and oil-water separator) and the standard operating procedure for inspecting, monitoring, and change out of carbon canisters and flares.

### **Section III: Appendices**

## **Appendix 1 – BPP Letter to Department of Justice**



Jessica L. Gonzalez

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June 7, 2013

Susan M. Akers, Esq.  
Senior Attorney  
Environmental Enforcement Section  
Lands and Natural Resources Division  
United States Department of Justice  
ENDR Mailroom, Room 2121  
601 D Street N.W.  
Washington DC 20004

Re: **Issues Arising Under The Whiting Consent Decree**

Dear Susan:

As you may be aware, I have assumed from Jim Nolan primary responsibility within BP Legal for assisting Whiting Refinery with its implementation of the recently entered Whiting Consent Decree. I look forward to working with you and EPA in that process and would appreciate being copied on any correspondence from the government to BP Products North America Inc. (BPP) that is related to that Decree.

The primary purpose of this letter is to identify some issues that have arisen regarding the language of the Decree. These issues fall into three categories:

- Changes to the language of the Decree that were agreed to prior to entry but that did not get incorporated because the Court entered the lodged version of the Decree rather than the version attached to the United States' Motion for Entry.
- Concerns that have arisen regarding the method prescribed by the Decree for certification of the total sulfur monitors required by Section H of the Decree.
- Various other minor errors and ambiguities in the language of the Decree.

In addition, we are taking this opportunity to apprise the government of certain aspects of the implementation process of which BPP wants EPA to be aware, although BPP does not believe any action by the Parties is required with respect to those matters.

A. **Changes Intended to Have Been Made Upon Entry**

As you will recall, after the Whiting Consent Decree was lodged, four errors or omissions were identified that the United States agreed to correct in the version of the Decree that would actually be entered. See "United States of America's Unopposed

Motion For Entry Of Consent Decree" filed September 12, 2012 at p. 3. These changes were as follows:

1. In the first column of the fourth row of the table on page 105 (Paragraph 183 of the Decree), the reference to "Subparagraph 8.b." was to be changed to "Subparagraph 185.b."
2. In paragraph 22 of Appendix D, the two references to Paragraph 44 were to be changed to refer to Paragraph 43.
3. In Appendix FLR-11, on page FLR-11-2, Paragraph V.A.b. was to be revised to read as follows (added language underlined):

8-Hour Repeatability (applies to all measured components except water):

- ± 0.5% of full scale for full scale ranges from 2-100%;
- ± 1% of full scale for full scale ranges from 0.05-2%;
- ± 2% of full scale for full scale ranges from 50-500 ppm;
- ± 3% of full scale for full scale ranges from 5-50 ppm;
- ± 5% of full scale for full scale ranges from 0.5-5 ppm.

The 8-Hour Repeatability range for water shall not be more than ± 3% of full scale

4. A signature page for Hoosier Environmental Council was to be added.

When the United States moved for entry, it provided the Court with a revised version of the Decree that included the foregoing changes, and its motion for entry identified the changes and advised the court that the revised version, which was attached to the Motion, was the version of the Decree that should be entered. Unfortunately, the court appears to have missed this point and proceeded to enter the version that had been originally lodged.

These four changes – but particularly the change to Appendix FLR-11 – are potentially significant. If not corrected, they seem likely to create confusion as time passes and the people aware of the history related to the decree move on. BPP believes, therefore, that it is important to address these errors and omissions now. Probably the best way to do this is for the Parties to join in a motion to amend the Decree. However, if the United States and the other Parties can agree that these are ministerial changes that do not require Court approval, then it may be acceptable to address these issues via a letter agreement among the Parties.

B. Issues Related To Certification of the Total Sulfur Monitors

Whiting is beginning to install and certify the total sulfur analyzers required by Section V.H. of the Decree. Paragraph 42.c. of that Decree requires that ATSM D3246-05 be used as the reference method for RAA and RATA tests. In seeking to certify the first of

the total sulfur analyzers to be installed, Whiting encountered several problems related to this ASTM method.

Whiting's normal testing consultant, ARI, Inc., is not familiar with and is not equipped to perform ASTM D3246 testing and recommended using USEPA Methods 15 and/or 16B. However, because those methods do not measure all sulfur species, the results of those tests would likely be biased somewhat low, making the RATA tests more difficult to pass. BPP located an alternative lab, Interek, that is equipped to do ASTM 3246. However, Intertek recommends that a closely related test – ASTM D6667 – be used instead. Attachments 1 and 2 to this letter are, respectively, a comparison of the principal elements of ASTM D3246 and D6667 and a 2004 letter from EPA to API authorizing the use of ASTM D6667 in lieu of D3246 for testing the sulfur content of butane. The letter concludes that ASTM D6667 is "more reliable, more readily available and a better test method than the currently designated test method ASTM D 3246."

However, the principal concern with both of the ASTM methods is that, unlike the EPA methods, neither is currently available for field mobilization. As a consequence, using either of these methods requires that integrated samples of the fuel gas be collected and sent to an off-site laboratory for analysis. While such integrated sampling and off-site analysis is allowed under 40 CFR Part 60, Subpart B (see section 8.4.3.1 of PS-2), BPP's past experience using bag sampling procedures for purposes of total sulfur analysis has indicated some problems with preservation of the non-H<sub>2</sub>S sulfur species..

Given these issues, Whiting is currently undertaking some trial sampling and testing using the ASTM methods in an effort to verify that the bag sampling and off-site analysis does not undermine accuracy. The initial round of such testing was inconclusive, however, since the fuel gas sampled contained very little non-H<sub>2</sub>S sulfur.

A total sulfur analyzer will be installed on Whiting's main fuel gas mix drum, the SRP mix drum, during the third quarter of this year. This is expected to be the mix drum with the highest concentration of non-H<sub>2</sub>S sulfur. Once installation of this monitor is complete, Whiting will conduct a second round of testing to evaluate the suitability of the bag sampling/off-site analysis procedure for use as a reference method for the total sulfur analyzers. The results of that testing will be shared with EPA, of course.

In the meantime, however, we would ask EPA to consider two questions:

- Assuming the issues regarding bag sampling and off-site analysis can be resolved, would EPA approve ASTM D6667 as an alternative reference method for RATAs and RAA tests on the total sulfur monitors; and
- Independent of that question, would EPA also consider allowing modified versions of Methods 15 and 16B to be used for these purposes. Unlike the total sulfur monitors themselves, which combust the fuel gas and measure the resulting SO<sub>2</sub>, Methods 15 and 16Bm, even if modified, will likely miss trace sulfur compounds in the fuel gas and will thus be biased somewhat low. Yet, if

the monitor readings are within 20% of the results of the modified Method 15/16B results, that will still provide reasonable assurance that the monitor results are accurate.

Whiting representatives will be contacting Kostis Loukeris to discuss this issue in the near future. Please advise us if there are others that should be included in these discussions.

C. Additional Errors and Ambiguities

In addition to the foregoing, BPP has identified several other minor errors and ambiguities in the Decree. At the same time that steps are taken to address the four issues discussed in Section A above, BPP believes it would be worthwhile to address these other issues as well:

1. §152.b.iv. - Canister Replacement Reports – This paragraph refers to “the next quarterly report submitted pursuant to Part VIII.” The reference to “quarterly” should be changed to “semi-annual.”
2. §166.a. – Formula For Calculating SRP SO<sub>2</sub> limits – The numerator of the formula in this paragraph contains an extraneous factor “h” that should be deleted. This was originally intended to refer to hours, but that factor became unnecessary when the flow factor (F) was changed from average flow per hour to total flow per month.
3. §102– Report Certifications – This paragraph requires that reports submitted under the Decree be certified by “an officer of BPP responsible for overseeing implementation of this Consent Decree.” While the current Business Unit Leader at Whiting does happen to be “an officer of BPP,” this may not always be the case. BPP would like to see Paragraph 102 revised to read as follows:

“Each report will be certified for BPP by the person responsible for environmental management and compliance at Whiting Refinery.”

This is the language used in the 2001 BP Decree.

4. App. B, Part K - Audit Frequency – The agreement of the Parties regarding LDAR audit frequency is that Whiting would be required to conduct third-party audits every two years and that there would be no requirement to do internal audits in the intervening years. The decision to do such internal audits would be left to BPP’s discretion.<sup>1</sup> Unfortunately, the language of Paragraphs 27 and 28, and particularly the title of Paragraph 28, creates some ambiguity as to whether internal audits are required in the years between the required external audits. To

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<sup>1</sup> This is consistent with – indeed more stringent than – the Hovensa, Murphy Oil and Countrymark Consent Decrees. In each of those, audits are required every two years, but those audits must be performed by third parties only every four years. The intervening audits are to be conducted by persons internal to the company. By contrast, all of Whiting’s bi-annual audits must be performed by 3<sup>rd</sup> parties.

address this ambiguity, BPP proposes that the title to Paragraph 28 be renamed "External Audits" and that the last two sentences of Paragraph 27 be deleted since those sentences relate to voluntary audits rather than audits required by the Decree. Whiting representatives have already discussed this issue with Kosta Loukeris of USEPA Region V, the EPA LDAR "tag" for the Whiting CD, and Mr. Loukeris has confirmed that the intent of the Decree was to require external audits every two years and to leave the decision on whether to perform internal audits in the intervening years to BPP's discretion.

5. App. D, ¶43 – Waste Gas Minimization Reporting for the LPG Flare – This paragraph refers to "the semi-annual report due in January of 2015." The reference to "January of 2015" should be changed to "February of 2015." See ¶98.
6. App. D, ¶72. – Monitor Equipment Downtime Reporting – The introductory language to Appendix D, ¶72 states that "BPP shall provide a summary of the following per Covered Flare and the LPG Flare per calendar quarter (hours shall be rounded to the nearest tenth):" It is somewhat unclear whether the "per calendar quarter" refers to how the data is to be compiled or how frequently it is to be reported or both. BPP believes that the intent here is to have the data compiled on a quarterly basis, but reported semi-annually in the Part VII reports. To clarify this intent, BPP suggests that the sentence be revised to read as follows:

" . . . BPP shall provide a summary, in the semiannual reports required by Part VII of the Consent Decree, of the following per Covered Flare and the LPG Flare per calendar quarter (hours shall be rounded to the nearest tenth):"
7. App. D, FLR-3, Equation 1 - LFL<sub>vg</sub> Calculations – The key to abbreviations on pp. FLR-3-6 and 3-7 of Appendix FLR-3 defines variable  $x_i$  as used in Equation 1 as the volume fraction of compound  $i$  in the vent gas, but it defines the variable LFL <sub>$i$</sub>  in that same formula as the volume percent at which the compound  $i$  is flammable. These two variables need to be consistent. To correct this, BPP suggests that the definition of LFL <sub>$i$</sub>  be revised to be the volume fraction at which the compound  $i$  is flammable as shown in Table 1 of Appendix FLR-3. In addition, the resulting LFL<sub>vg</sub> should be defined as the volume fraction rather than volume percent at which the vent gas is flammable.
8. App. D, FLR-18, ¶ 5 – Calculating SO<sub>2</sub> Emissions From Tail Gas Incidents – The explication of the variable in the formula states that "Standard conditions = 68 degree F.; 14.7 lb<sub>force</sub>/sq. in. absolute." However, the formula uses 379 scf SO<sub>2</sub>/lb-mole SO<sub>2</sub>, which is the correct value where standard conditions is defined at 60 deg F. and one atmosphere. We recommend that the last sentence in this

explication be revised to provide that "Standard conditions = 60 degree F.; 14.7 lb<sub>force</sub>/sq. in. absolute."

D. Other Matters Related to Implementation

Lastly, there are four other matters concerning implementation of the Decree of which BPP believes the United States should be aware. We do not currently believe that any action is required to address these issues, however.

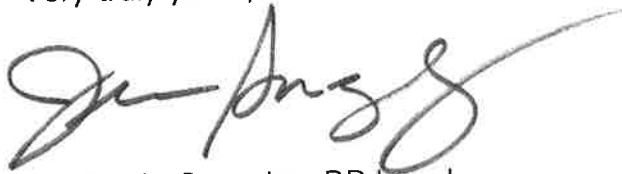
1. App D, § A ¶1. - Interim S/VG Control Room Displays – BPP has installed the systems, required by § A ¶1 of Appendix D, that depict the S/VG ratio for each Covered Flare on the flare's control panel. However, because these systems utilize data from the Refinery's existing monitoring and instrumentation, the problems with that existing equipment that BPP identified during the Consent Decree negotiations mean that the data presented on the displays may not be accurate and may in some case not be meaningful.
2. App. D, §§ B. and L. - Location of Flare H<sub>2</sub>S CEMS – The H<sub>2</sub>S CEMS required by Ja for the South and GOHT flares, and perhaps for all of the other flares as well, will be located upstream of the seal drum. As a consequence, under normal circumstances, when the water seal is in place, the CEMS will be monitoring gas that is not being burned in the flare but that is being recovered by the flare gas recovery compressors. Since gas that is not burned is not "fuel gas" within the meaning of Ja, the data collected during periods when the water seal is in place is not relevant for purposes of determining compliance with Subpart Ja. BPP will use the criteria in ¶37 of App D to determine when the water seal is in place.
3. App. D, FLR-11, Section VII. a. – This paragraph requires that the wind speed sensors be calibrated annually to  $\pm 10\%$ . Under normal conditions, meeting this should not be a problem. However, vendor-supplied information indicates that demonstrating  $\pm 10\%$  accuracy may not be possible at wind speeds below 2 miles per hour.
4. Region IV LDAR Applicability Determination – It has recently come to BPP's attention that in November 2011, Region IV issued a "regulatory interpretation" indicating that 40 CFR Part 60 Subpart VVa (and therefore Subpart GGGa, which references VVa) requires initial LDAR monitoring to be completed within 30 days of initial startup of a new unit. BPP and most of industry have historically interpreted VVa and GGGa to allow 180 days after initial startup to complete initial monitoring. It is very difficult, if not impossible, to complete tagging and monitoring of all the components of a large process unit within 30 days of its initial startup. In some cases, the unit may not even run for the entire thirty days immediately following initial

Susan M. Akers, Esq.  
June 7, 2013  
Page 7

startup. This issue is particularly acute for Whiting given the large number of very large new units that will be starting up as a part of the WRMP. Whiting has discussed its concerns regarding the Region IV interpretation with Mr. Loukeris, and Mr. Loukeris has agreed to look into the applicability of this interpretation to Whiting. In the meantime, however, Mr. Loukeris concurred that even if Region IV's interpretation is correct and applicable to Whiting, Paragraph 63 of the Consent Decree provides Whiting with a year from the date of entry to achieve compliance with this requirement.

When you have had an opportunity to consider these matters, please contact either me or Bob Genovese to discuss the government's thoughts on how to proceed.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Jessica L. Gonzalez', with a stylized, flowing script.

Jessica L. Gonzalez, BP Legal

JLG:tlr  
Enclosure

cc: S. Shermer, USDOJ EES  
J. Fogarty, USEPA OECA  
P. Foley, USEPA OECA  
C. Loukeris, USEPA Region V ARD  
W. Wagner, USEPA Region V ORC  
M. McAullife, USEPA Region V  
ORC

R. Genovese BP Regulatory Affairs  
L. Wilson, BP Whiting  
J. Nolan BP, Legal  
M. Osadjan, BP Legal  
K. Comey, BP ECAT  
W. Patberg, SL&K

# Attachment 1 - Comparison of ASTM Methods D3246 and D6667

Sample/Analysis System Requirements	ASTM D6667	ASTM D3246
Physical state of sample	"Gases or Liquefied Petroleum Gases (LPG)"	"Hydrocarbon products that are gaseous at normal room temperature and pressure"
Range of Concentrations	"1 to 100 mg/kg" by weight	"1.5 to 100 mg/kg" by weight
Sample Volume	10-20 ml (gaseous) 15 ml (LPG)	Use syringe to inject sample through septum in side arm upstream of furnace
Sample Introduction	Heated gas sample valve connected to a heated expansion chamber upstream of pyrolysis furnace. Inlet system maintained at 80°C	Septum covered side arm in inlet tube to pyrolysis furnace
Interference control	Moisture removal system required	Not required
Furnace Temperature	1075°C	Maintain 3 zones <ul style="list-style-type: none"> <li>• Inlet zone &gt;700°C</li> <li>• Pyrolysis zone &gt;1,000°C</li> <li>• Outlet zone &gt;800°C</li> </ul>
Oxygen concentration	70 – 72%	80%
Measurement Technology	<ul style="list-style-type: none"> <li>• SO<sub>2</sub> produced in combustion zone is exposed to ultraviolet light to form an excited state.</li> <li>• Excited state SO<sub>2</sub> fluoresces and emitted light of a specific wavelength.</li> <li>• Emitted light is filtered and detected by a photomultiplier tube.</li> </ul>	<ul style="list-style-type: none"> <li>• SO<sub>2</sub> produced in pyrolysis section bubbles through a titration cell with a sensor referenced pair of electrodes and filled with Iodide/azide solution.</li> <li>• SO<sub>2</sub> reacts with I<sup>3-</sup> ions.</li> <li>• Electrical imbalance is caused between sensor and reference cell is offset by electrical generator</li> <li>• Coulombs of electrical flow into the sample cell is measured.</li> </ul>
Calibration Materials	<ul style="list-style-type: none"> <li>• Correlation studies used dimethyl sulfide in propane calibrations gases obtained from and certified by commercial manufacturers or,</li> <li>• Standards prepared by permeation tubes.</li> </ul>	<ul style="list-style-type: none"> <li>• Liquid standards n-butyl sulfide in octane are prepared gravimetrically</li> </ul>
Calibration Procedures	<ul style="list-style-type: none"> <li>• Multi-point calibration curve</li> <li>• Triplicate injections of each standard and sample gas.</li> </ul>	Series of standards within range of sample concentration are injected in triplicate.

## Attachment 2



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

JUN 16 2004

OFFICE OF  
ENFORCEMENT AND  
COMPLIANCE ASSURANCE

Mr. Peter Lidiak  
American Petroleum Institute  
1220 L Street, N.W.  
Washington, DC 20005-4070

Re: Request for Exercise of Enforcement Discretion for Certain Test Methods  
Measuring Parameters in Gasoline

Dear Mr. Lidiak:

This letter is in response to your request on behalf of the American Petroleum Institute (API) that the United States Environmental Protection Agency (EPA) exercise its enforcement discretion to allow the use of certain alternative test methods for measuring aromatics and oxygenates in gasoline, and the sulfur content of butane, pending two rulemakings that would authorize the use of these test methods.

Alternative Test Methods ASTM D 1319 and 4815

The fuel regulations at 40 C.F.R. § 80.46 specify the test methods that refiners and importers must use to measure the parameters of reformulated gasoline (RFG). Particularly, these regulations allow the use of the American Society of Testing and Materials (ASTM) D 1319 and ASTM D 4815 as alternative test methods for measuring total aromatics and oxygenates in RFG, respectively. 40 C.F.R. § 80.46(d)(3)(i) and 80.46(g)(2)(i). However under the regulations, these alternative test methods are no longer available after September 1, 2004.

EPA believes that these alternative test methods continue to be appropriate for determining aromatics and oxygenates in RFG and do not result in environmental degradation. EPA intends to promulgate a rule allowing the use of these alternative test methods to continue indefinitely.

Pending completion of this new rule, EPA's Office of Air and Radiation (OAR) has requested that EPA's Office of Enforcement and Compliance Assurance (OECA) allow the use of these test methods. Accordingly, pending final promulgation of the rule, OECA will exercise its enforcement discretion to allow the use of these alternative test methods, provided that the test results are correlated with the designated test methods, ASTM D 5769 and ASTM D 5599, respectively, as described in the current regulations. This exercise of enforcement discretion is effective on September 1, 2004, until the date the rule change described above becomes effective,

or until December 31, 2005, whichever is earlier.

Test Method ASTM D 6667

Additionally, the regulations designate ASTM D 3246 as the test method for measuring sulfur in butane. 40 C.F.R. § 80.46(a)(2). EPA plans to issue a revised rule that would specify ASTM D 6667 as the designated test method for determining the sulfur content in butane. EPA believes ASTM D 6667 is more reliable, more readily available, and a better test method than the currently designated test method, ASTM D 3246.

Pending completion of this new rule, as requested by OAR, OECA will exercise its enforcement discretion to allow the use of ASTM D 6667, as an alternative to the currently designated test method. This exercise of enforcement discretion is effective immediately and will continue until the date the rule change described above becomes effective, or until December 31, 2005, whichever is earlier.

If you have any questions regarding this matter, you may call Adam Kushner, Director of the Air Enforcement Division, at (202) 564-7979.

Sincerely yours,



Thomas V. Skinner  
Acting Assistant Administrator

cc: Jeffrey Holmstead  
Assistant Administrator  
Office of Air and Radiation  
202-501-0986 (FAX)

Wayne H. Nastri,  
Regional Administrator  
Region 9  
415-947-3588 (FAX)

National Petroleum Refiners Association  
202-457-0486 (FAX)

Petroleum Marketers Association of America  
703-351-9160 (FAX)

**Appendix 2a – 3<sup>rd</sup> Quarter 2013 CEM Summary Performance  
Report**



BP Products North America Inc.  
2815 Indianapolis Blvd.  
P O Box 710  
Whiting, IN 46394-0710  
USA

October 25, 2013

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

Mr. Dave Cline  
Section Chief  
Indiana Department of Environmental Management  
Compliance Data Section, Office of Air Quality  
100 North Senate Avenue  
MC 61-53 IGCN 1003  
Indianapolis, IN 46204-2251

Dear Mr. Cline:

Re: CEM Summary Performance Report – Third Quarter 2013  
BP Products North America Inc. - Whiting Business Unit  
Part 70 Operating Permit No. T089-6741-00453 for SPM No. 089-29033-00453

Attached please find the Continuous Emission Monitor (CEM) summary performance reports for the BP Products North America Inc. - Whiting Business Unit (BP Whiting) for the units listed below. This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453, for Significant Permit Modification (SPM) No. 089-32755-00453, issued on April 23, 2013, and fulfills the reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). BP Whiting has chosen to also include the NO<sub>x</sub> CEMS Summary Performance Report for the No. 3 Stanolind Power Station (3SPS), which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. This report is for the period beginning on July 1, 2013 through September 30, 2013. See Table 1 for a complete list of permitted emissions units and relevant pollutants monitored by CEMs.

As part of Permit Condition C.12 of SPM 089-32755-00453 and 40 CFR 60.108a(d)(5) and (6), information required for downtime and excess emissions are included as follows. All CEMS included in this report operated with downtime totaling less than 5% of the total operating time for the quarter. Nevertheless, it should be noted that downtime occurred at the Cat Feed Hydrotreater Unit (CFHU) Hydrogen Sulfide (H<sub>2</sub>S), Catalytic Refining Unit (CRU) H<sub>2</sub>S, No. 4 Ultraformer (4UF) H<sub>2</sub>S, Distillate Desulfurizer Unit (DDU) Flare H<sub>2</sub>S, No. 12 Pipestill (12PS) Heaters H-101A, H-101B, and H-102 Nitrogen Oxides (NO<sub>x</sub>) and Carbon Monoxide (CO), South Flare Total Sulfur (TS), Beavon-Stretford Tail Gas Unit (BS TGU) Total Reduced Sulfur (TRS), Sodium Bisulfate (SBS) TGU Sulfur Dioxide (SO<sub>2</sub>), Sulfur Recovery Unit (SRU) Incinerator SO<sub>2</sub>, SRU No. 1 Claus Off-Gas Treatment (COT1) TGU CO and SO<sub>2</sub>, 500 Fluid Catalytic Cracking Unit (FCU 500) NO<sub>x</sub>, CO, and SO<sub>2</sub>, and No. 3 Stanolind Power Station (3SPS) Boilers 31, 33, and 36 NO<sub>x</sub> and CO CEMS as follows.

October 25, 2013

Page -2-

- On August 15, 2013, the CFHU H<sub>2</sub>S CEMS experienced two (2) hours of downtime as a result of a digital output failure. On September 9 and 10, 2013, the CEMS experienced thirty-two (32) hours of downtime as a result of low plant nitrogen supply to the CEMS for valve switching. On September 17, 2013, the CEMS experienced one (1) hour of downtime as a result of the quarterly Cylinder Gas Audit. On September 29, 2013, the CEMS experienced five (5) hours of downtime as a result of a fault alarm. A review of process parameters before, during, and after the events, demonstrates that emissions units associated with the CFHU H<sub>2</sub>S CEMS did not exceed any emissions limits during the downtime periods.
- On August 20, 2013, the CRU H<sub>2</sub>S CEMS experienced two (2) hours of downtime as a result of a shelter HVAC failure and alarm. A review of process parameters before, during, and after the event, demonstrates that emissions units associated with the CRU H<sub>2</sub>S CEMS did not exceed any emissions limits during the downtime periods.
- On August 20, 2013, the 4UF H<sub>2</sub>S CEMS experienced six (6) hours of downtime as a result of a fault alarm and I/O failure. On September 17, 2013, the CEMS experienced one (1) hour of downtime as a result of the quarterly Cylinder Gas Audit. A review of process parameters before, during, and after the event, demonstrates that emissions units associated with the 4UF H<sub>2</sub>S and TS CEMS did not exceed any emissions limits during the downtime periods.
- From July 1, 2013, through July 31, 2013, the DDU Flare H<sub>2</sub>S CEMS experienced several downtime periods totaling one hundred (100) hours of downtime as a result of many factors, ultimately related to contamination of the CEMS sampling system.
- On September 20, 2013, the 12PS Heaters H-101A and H-101B NO<sub>x</sub> and CO CEMS experienced one (1) hour of downtime each as a result of a Cylinder Gas Audit. A review of process parameters before, during, and after the event, demonstrates that the 12PS H-101A and H-101B did not exceed any emissions limits during the downtime periods.
- On September 20, 2013, the 12PS Heater H-102 NO<sub>x</sub> and CO CEMS experienced four (4) hours of downtime as a result of recalibrating the analyzers due to excessive drift and quality assurance calibrations. A review of process parameters before, during, and after the event, demonstrates that the 12PS H-102 did not exceed any emissions limits during the downtime periods.
- On July 31, 2013, the South Flare TS CEMS experienced two (2) hours of downtime as a result of preventive maintenance. On September 25, 2013, the South Flare H<sub>2</sub>S CEMS experienced two (2) hours of downtime as a result of the quarterly Cylinder Gas Audit. The flare gas recovery unit was operating and, as such, there were no excess emissions during the downtime period.
- On August 13, 2013, the BS TGU TRS CEMS experienced sixteen (16) hours of downtime as a result of an analyzer power supply failure. A review of process parameters before, during, and after the event, demonstrates that the BS TGU did not exceed any emissions limits during the downtime periods.
- On September 10, 2013, the SBS TGU SO<sub>2</sub> CEMS experienced three (3) hours of downtime as a result of a keypad failure during the quarterly Cylinder Gas Audit. A

October 25, 2013

Page -3-

review of process parameters before, during, and after the event, demonstrates that the SBS TGU did not exceed any emissions limits during the downtime periods.

- On August 17, 2013, the SRU Incinerator SO<sub>2</sub> CEMS experienced eight (8) hours of downtime as a result of a brief power outage. Acid gas was not being vented to the Incinerator and, as such, there were no excess emissions during the downtime period.
- On September 17, 2013, the SRC COT1 TGU SO<sub>2</sub> and CO CEMS experienced four (4) hours of downtime as a result of a quality assurance calibration. A review of process parameters before, during, and after the event, demonstrates that the SRC COT1 TGU did not exceed any emissions limits during the downtime periods.
- From July 20, 2013, through September 24, 2013, the FCU 500 NO<sub>x</sub>, CO, and SO<sub>2</sub> CEMS experienced sixty-six (66), fifty-four (54), and eighty-five (85) hours of downtime, respectively, as a result of many factors, ultimately related to sample line integrity issues, but some downtime related to a brief power outage. A review of the process parameters, before and after the events, i.e., unit feed rate, ammonia injection rates, regenerator bed temperature, percent excess oxygen, feed sulfur analysis, and SO<sub>x</sub> additive injection rate demonstrate that the FCU 500 did not exceed any emissions limits during the CEMS downtime period.
- On July 22, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 31 experienced three (3) hours of downtime as a result of the quarterly Linearity check. On August 7, 2013, the NO<sub>x</sub> CEMS experienced two (2) hour of downtime as a result of preventive maintenance.
- On July 11, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 33 experienced one (1) hour of downtime as a result of the quarterly Linearity check.
- On July 11, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 36 experienced one (1) and hour of downtime as a result of preventive maintenance. On July 25, 2013, the NO<sub>x</sub> and CO CEMS experienced two (2) hour of downtime as a result of the quarterly Linearity check. On August 12, 2013, the NO<sub>x</sub> CEMS experienced one (1) hour of downtime as a result of preventive maintenance. On August 25, 2013, the NO<sub>x</sub> and CO CEMS experienced one (1) hour of downtime as a result of HVAC failure and preventive maintenance.

Excess emissions for third quarter occurred at the FCU 500 CO CEMS, as summarized below.

- On September 10, 2013, the 1-hour rolling average for CO at the FCU500 was exceeded, for two (2) hours, as a result of water in the fresh feed resulting in a unit upset. Clean, fresh feed was restored and the unit was restored to stable operations.

The Summary, Excess Emissions, Downtime, and results of the Cylinder Gas Audit are included in this report for the temporary CEMS only.

Additional detail on these excess emissions and analyzer downtime episodes and corrective actions taken can be found in the excess emissions and downtime reports, included in Attachment B.

October 25, 2013

Page -4-

Table 1. Emission Units and Relevant Pollutants Monitored by CEMS

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<b>Cat. Feed Hydrotreating Unit (CFHU) Fuel Drum</b>				
- CFHU heater F-801A/B - CFHU heater F-801 C	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- CFHU heater F-801A/B - CFHU heater F-801 C	Total sulfur	Permit Section D.19	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
<b>Ultraformer Isomerization Unit / Catalytic Refining Unit (UIU/CRU) Fuel Drum</b>				
- Isomerization Unit (ISOM) heater H-1 - Catalytic Refining Unit (CRU) heater F-101 - CRU heater F-102A	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- ISOM heater H-1 - CRU heater F-101 - CRU heater F-102A	Total Sulfur	Permit Section D.9 and D.20	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
<b>#4 Ultraformer (4 UF) Fuel Drum</b>				
- 4 UF heater F-1 - 4 UF heater F-2 - 4 UF heater F-3 - 4 UF heater F-4 - 4 UF heater F-5 - 4 UF heater F-6 - 4 UF heater F-7 - 4 UF heater F-8A - 4 UF heater F-8B - Blending Oil Unit (BOU) heater F-401	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- #4 UF heater F-1 - #4 UF heater F-2 - #4 UF heater F-3 - #4 UF heater F-4 - #4 UF heater F-5 - #4 UF heater F-6 - #4 UF heater F-7 - #4 UF heater F-8A - #4 UF heater F-8B - BOU heater F-401	Total Sulfur	Permit Section D.16  Permit Section D.11	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
<b>DDU Flare</b>	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	

October 25, 2013

Page -5-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<b>Sulfur Recovery Unit (SRU) Mix Fuel Drum</b>				
<ul style="list-style-type: none"> <li>- 3SPS Boiler 31</li> <li>- 3SPS Boiler 32</li> <li>- 3SPS Boiler 33</li> <li>- 3SPS Boiler 34</li> <li>- 3SPS Boiler 36</li> <li>- No. 11 Pipe Still (11 PS) heater H-1X</li> <li>- 11 PS heater H-2</li> <li>- 11 PS heater H-3</li> <li>- No. 11B Coker heater H-101</li> <li>- No. 11B Coker heater H-102</li> <li>- No. 11B Coker heater H-103</li> <li>- No. 11B Coker heater H-104</li> <li>- 11 PS heater H-300</li> <li>- No. 12 Pipe Still (12 PS) heater H-1AS</li> <li>- 12 PS heater H-1AN</li> <li>- 12 PS heater H-1B</li> <li>- 12 PS heater H-2</li> <li>- 12 PS heater H-1CN</li> <li>- 12 PS heater H-1CX</li> <li>- Aromatics Recovery Unit (ARU) heater F-200A</li> <li>- ARU heater F-200B</li> <li>- Distillate Desulfurization Unit (DDU) heater WB-301</li> <li>- DDU heater WB-302</li> <li>- Hydrogen Unit (HU) heater B-501 for refinery fuel gas</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
<ul style="list-style-type: none"> <li>- 11 PS heater H-200</li> <li>- 3SPS Duct Burner 1</li> <li>- 3SPS Duct Burner 2</li> <li>- 3SPS Duct Burner 3</li> <li>- 3SPS Duct Burner 4</li> <li>- 3SPS Duct Burner 6</li> <li>- 12 PS heater H-101A</li> <li>- 12 PS heater H-101B</li> <li>- 12 PS heater H-102</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	3SPS Duct Burner 6 started up in January 2011
<ul style="list-style-type: none"> <li>- #2 Coker heater F-201</li> <li>- #2 Coker heater F-202</li> <li>- #2 Coker heater F-203</li> <li>- Gas Oil Hydrotreating (GOHT) heater F-901A</li> <li>- GOHT heater F-901B</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	Not included in this report because the following units have not yet started up.  Note the #2 Coker heaters F-201, 202, and 203 are labeled H-201, 202, and 203 in the permit.

October 25, 2013

Page -6-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
- 11 PS heater H-1X - 11 PS heater H-2 - 11 PS heater H-3 - 11 PS heater H-200 - 11 PS heater H-300 - ARU heater F-200A - ARU heater F-200B - DDU heater WB-301 - DDD heater WB-302 - HU heater B-501 for refinery fuel gas - 3SPS Boiler 31 - 3SPS Boiler 32 - 3SPS Boiler 33 - 3SPS Boiler 34 - 3SPS Boiler 36 - 12 PS heater H-101A - 12 PS heater H-101B - 12 PS heater H-102 - #2 Coker heater F-201 - #2 Coker heater F-202 - #2 Coker heater F-203 - GOHT heater F-901A - GOHT heater F-901B	Total Sulfur	Permit Section D.1  Permit Section D.10 Permit Section D.18 Permit Section D.17 N/A  Permit Section D.3  Permit Section D.2  Permit Section D.42	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>          3SPS Boilers 1, 2, 3, 4, and 6 are not required to be monitored for Total Sulfur.  Unit started up in June 2013  Unit has not started up  Unit has not started up
- #2 Coker heater F-201	NOx	Permit Section D.2	326 IAC 3-5-7	Not included in this report, because the unit has not yet started up.
- #2 Coker heater F-201	CO	Permit Section D.2	326 IAC 3-5-7	
- #2 Coker heater F-202	NOx	Permit Section D.2	326 IAC 3-5-7	Not included in this report, because the unit has not yet started up.
- #2 Coker heater F-202	CO	Permit Section D.2	326 IAC 3-5-7	
- #2 Coker heater F-203	NOx	Permit Section D.2	326 IAC 3-5-7	Not included in this report, because the unit has not yet started up.
- #2 Coker heater F-203	CO	Permit Section D.2	326 IAC 3-5-7	
- 12 PS heater H-101A	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
- 12 PS heater H-101A	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
- 12 PS heater H-101B	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
- 12 PS heater H-101B	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
- 12 PS heater H-102	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
- 12 PS heater H-102	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
- Distillate Hydrotreating (DHT) Unit heater B-601A	NOx	Permit Section D.37	326 IAC 3-5-7	
- DHT Unit heater B-601A	CO	Permit Section D.37	326 IAC 3-5-7	
GOHT Flare - Routine or planned non-routine streams	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	Not included in this report because the unit has not yet started up.

October 25, 2013

Page -7-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
GOHT Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	Not included in this report because the unit has not yet started up.
South Flare - Routine or planned non-routine streams	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on May 17, 2013.
South Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on May 17, 2013.
Sodium Bisulfite Tail Gas Unit (SBS TGU)	SO <sub>2</sub>	§60.105(a)(5)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
Beavon Stretford Tail Gas Unit (B/S TGU)	TRS measured as SO <sub>2</sub>	§60.105(a)(7)	326 IAC 3-5-7 and 40 CFR 60.7(c)	This unit complies with requirements through an AMP approved per §60.105(a)(7)(ii) on Aug. 30, 2006
SRU Standby Incinerator	SO <sub>2</sub>	§60.105(a)(7)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
SRU Claus Offgas Treater #1 (COT1)	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on September 8, 2013.
SRU COT1	SO <sub>2</sub>	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on September 8, 2013.
SRU COT2	CO	Permit Section D.4	326 IAC 3-5-7	Not included in this report, because the unit has not yet started up.
SRU COT2	SO <sub>2</sub>	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	Not included in this report, because the unit has not yet started up.
Fluid Catalytic Cracking Unit 500 (FCU-500)	NO <sub>x</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
FCU-500	CO	40 CFR 63, subpart UUU [40 CFR 60.1565(a)(1)] and §60.105(a)(2)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-500	SO <sub>2</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
Fluid Catalytic Cracking Unit 600 (FCU-600)	NO <sub>x</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
FCU-600	CO	40 CFR 63, subpart UUU [40 CFR 60.1565(a)(1)] and §60.105(a)(2)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-600	SO <sub>2</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
3SPS Boiler 31	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 31 and Duct Burner 1 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 32	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 32 and Duct Burner 2 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 33	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 33 and Duct Burner 3 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	

October 25, 2013

Page -8-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
3SPS Boiler 34	NOx	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 34 and Duct Burner 4 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 36	NOx	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 36 and Duct Burner 6 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	Duct Burner 6 started up in January 2011

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

<sup>2</sup> BP Whiting has chosen to also include the NO<sub>x</sub> CEMS Summary Performance Report for the 3SPS, which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. The 3SPS boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

In addition to the units listed in Table 1, BP Whiting is exempt from some continuous monitoring requirements through exemptions to NSPS J promulgated on June 24, 2008, after the operating permit was issued, and is complying with monitoring requirements in Operating Permit No. T089-6741-00453, for SPM No. 089-29033-00453, through approved Alternate Monitoring Plans (AMPs). 40 CFR 60, Subpart Ja is not effective until November 13, 2012, and there are no approved AMPs in use at BP Whiting at this time. Emission units and details of the exemptions and approved AMPs are provided below.

- The Chemical Grade Propylene (CGP) and Refinery Grade Propylene (RGP) streams vented during propylene loading are subject to the AMP approved June 17, 2011, that does not require monitoring because of the customer specification for low H<sub>2</sub>S concentrations.<sup>1</sup>
- Per 40 CFR 60.105(a)(4)(iv)(B), Polymer Grade Propylene (PGP) stream vented during propylene loading is exempt from the H<sub>2</sub>S limits and monitoring requirements because it meets a commercial-grade product specification less than 30 ppmv.<sup>1</sup>
- Per 40 CFR 60.105(a)(4)(iv)(C), the Hydrogen Unit (HU) heater B-501 is exempt from the H<sub>2</sub>S concentration limits and monitoring requirements because it combusts a fuel gas stream that is inherently low in sulfur content.
- Per 40 CFR 60.105(a)(4)(iv)(B), the LPG Flare is exempt from the H<sub>2</sub>S limits and monitoring requirements because only commercial grade LPG streams are tied to the flare.
- The two thermal oxidizers (Indiana Tank Farm Thermal Oxidizer & Berry Lake Tank Farm Thermal Oxidizer) are subject to the AMP approved per §60.105(a)(4) on January 9, 2006, requiring hydrogen sulfide (H<sub>2</sub>S) grab samples per steps established in the AMP.
- The Marketing Terminal - Vapor Combustion Unit (VCU) is subject to the AMP approved per §60.105(a)(4) on March 22, 2007, that does not require monitoring because there are relatively low H<sub>2</sub>S concentrations in the stream being loaded.

<sup>1</sup> The CGP, RGP, and PGP vent streams are not combusted at BP Whiting under normal operating scenarios.

October 25, 2013

Page -9-

Attachment A contains the CEMS summary report per 40 CFR 60.7(c) and (d).

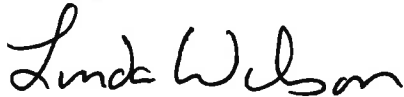
Attachment B contains the excess emission report and CEMS downtime report per 326 IAC 3-5-7 and 40 CFR 60.7(c).

Attachment C, where applicable, contains the results of the cylinder gas audits.

Attachment D contains the complete CEMS summary report, excess emission report, CEMS downtime report, and, where applicable, the results of the cylinder gas audits as provided by Praxair, Inc. for the CEMS currently operating at the New Hydrogen Unit (Section D.43).

If you have any questions or comments about the enclosed information, please contact Brandon Mik at (219) 473-3725.

Sincerely,

A handwritten signature in black ink that reads "Linda Wilson". The signature is written in a cursive, flowing style.

Linda Wilson  
Environmental Manager  
Health, Safety, Security and Environment

Attachments

cc: R. Tejuja - IDEM/NW Indiana (rtejuja@idem.in.gov)

**PART 70 OPERATING PERMIT  
CERTIFICATION**

Source Name: BP Products North America, Inc., Whiting Business Unit  
Source Address: 2815 Indianapolis Blvd., Whiting, IN 46394  
Mailing Address: P.O. Box 710, Whiting, Indiana 46394-0710  
Permit No.: T089-6741-00453

**This certification shall be included when submitting monitoring, testing  
reports/results or other documents as required by this permit.**

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☐ Test Results (specify)

☒ Report (Third Quarter 2013 CEM Summary Report per 326 IAC 3-5-7, 40 CFR 60.7(c), 326 IAC 10-4, and 40 CFR Part 75)


☐ Notification (specify)

☐ Affidavit (specify)

☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Signature of Responsible Official:



Printed Name:

Nick Spender

Title/Position:

Whiting Business Unit Leader

Phone:

(219) 473-3179

Date:

30<sup>th</sup> Oct 2013

## Attachment A

### CEMS Summary Report per 40 CFR 60.7(c) & (d) and 326 IAC 3-5-7

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H <sub>2</sub> S	
CFU Fuel Drum	Total Sulfur	CEMS began operation on March 27, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
CRU Fuel Drum	H <sub>2</sub> S	
CRU Fuel Drum	Total Sulfur	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
4UF Fuel Drum	H <sub>2</sub> S	
4UF Fuel Drum	Total Sulfur	CEMS began operation on March 27, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
DDU Flare	H <sub>2</sub> S	
SRU Mix Fuel Drum	H <sub>2</sub> S	
SRU Mix Fuel Drum	Total Sulfur	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
#2 Coker heater F-201	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-201	CO	Not included in this report because the unit has not yet started up.
#2 Coker heater F-202	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-202	CO	Not included in this report because the unit has not yet started up.
#2 Coker heater F-203	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-203	CO	Not included in this report because the unit has not yet started up.
12 PS heater H-101A	NO <sub>x</sub>	CEMS began operation on June 17, 2013.
12 PS heater H-101A	CO	CEMS began operation on June 17, 2013.
12 PS heater H-101B	NO <sub>x</sub>	CEMS began operation on June 19, 2013.
12 PS heater H-101B	CO	CEMS began operation on June 19, 2013.
12 PS heater H-102	NO <sub>x</sub>	CEMS began operation on June 23, 2013.
12 PS heater H-102	CO	CEMS began operation on June 23, 2013.
DHT heater B-601A	NO <sub>x</sub>	
DHT heater B-601A	CO	
GOHT Flare	H <sub>2</sub> S	Not included in this report because the unit has not yet started up.
GOHT Flare	Total Sulfur	Not included in this report because the unit has not yet started up.
South Flare	H <sub>2</sub> S	CEMS began operation on May 17, 2013.
South Flare	Total Sulfur	CEMS began operation on May 17, 2013.
B/S TGU	TRS	
SBS TGU	SO <sub>2</sub>	
SRU Standby Incinerator	SO <sub>2</sub>	
COT1	CO	CEMS began operation on September 8, 2013.
COT1	SO <sub>2</sub>	CEMS began operation on September 8, 2013.
COT2	CO	Not included in this report because the unit

Location/Emission Unit	Parameter	Notes
		has not yet started up.
<b>COT2</b>	<b>SO<sub>2</sub></b>	Not included in this report because the unit has not yet started up.
FCU 500	NO <sub>x</sub>	7-day rolling average
FCU 500	NO <sub>x</sub>	365-day rolling average
FCU 500	CO	
FCU 500	SO <sub>2</sub>	7-day rolling average
FCU 500	SO <sub>2</sub>	365-day rolling average
FCU 600	NO <sub>x</sub>	7-day rolling average
FCU 600	NO <sub>x</sub>	365-day rolling average
FCU 600	CO	
FCU 600	SO <sub>2</sub>	7-day rolling average
FCU 600	SO <sub>2</sub>	365-day rolling average
3SPS Boiler 31 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 31 and Duct Burner 1 <sup>2</sup>	CO	
3SPS Boiler 32 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 32 and Duct Burner 2 <sup>2</sup>	CO	
3SPS Boiler 33 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 33 and Duct Burner 3 <sup>2</sup>	CO	
3SPS Boiler 34 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 34 and Duct Burner 4 <sup>2</sup>	CO	
3SPS Boiler 36 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 36 and Duct Burner 6 <sup>2</sup>	CO	

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization Project (WRMP) are not required until the completion of the WRMP.

<sup>2</sup> The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 09/17/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	5	0.23
2. Non-Monitor CEMS Equipment Malfunction	32	1.45
3. Calibration/QA	1	0.05
4. Other Known Causes	2	0.09
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	40	1.81

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

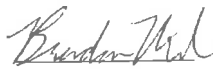
Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 60 ppmvd per 365-day rolling period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 09/17/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	5	0.23
2. Non-Monitor CEMS Equipment Malfunction	32	1.45
3. Calibration/QA	1	0.05
4. Other Known Causes	2	0.09
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	40	1.81

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: H<sub>2</sub>S

Emission Limit: 162 PPM (3 Hour Rolling Average)\*

Date of Latest CEMS Certification or Audit: 09/16/2013 (CGA)

Company Name: BP Products North America, Inc

Address: 2815 Indianapolis Whiting, IN 46394

Unit Description: Catalytic Refining Unit (CRU)

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	2.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	2.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.09%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.

<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MirkSignature: Brandon Mirk

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: H2S  
Emission Limit: 60 ppm (365 Day Rolling Average)  
Date of Latest CEMS Certification or Audit: 09/16/2013 (CGA)

Company Name: BP Products North America, Inc  
Address: 2815 Indianapolis Whiting, IN 46394  
Unit Description: Catalytic Refining Unit (CRU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	2.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	2.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.09%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

- 1 For gases, record all times in hours. For opacity, record all times in minutes.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K

Signature: Brandon M. K

Title: Environmental Engineer

Date: 10/25/2013

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 09/17/13 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	6	0.27
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 60 ppmvd per 365-day rolling period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 09/17/2013 (RATA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	6	0.27
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: H2S

Emission Limit: 162 PPM (3 Hour Rolling Average)\*

Date of Latest CEMS Certification or Audit: 09/03/2013 (CGA)

Company Name: BP Products North America, Inc

Address: 2815 Indianapolis Whiting, IN 46394

Unit Description: Distillate Desulfuration Unit (DDU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	100.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	100.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	4.53%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MikSignature: Brandon Mik

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35**

**Pollutant: H2S**

**Emission Limit: 162 ppm (3 Hour Rolling Average)**

**Date of Latest CEMS Certification or Audit: 09/06/2013 (CGA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Sulfur Recovery Unit (SRU)

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mirk

Signature: Brandon Mirk

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: H2S  
Emission Limit: 60 ppm (365 Day Rolling Average)  
Date of Latest CEMS Certification or Audit: 09/06/2013 (CGA)

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Sulfur Recovery Unit (SRU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mik

Signature: Brandon Mik

Title: Environmental Engineer

Date: 10/25/2013

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day

Emission Limitation: 60 ppm

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 29.5 tons per 12 consecutive month

Reporting Period Dates: From 04/01/2013 To 06/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day

Emission Limitation: 60 ppm

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

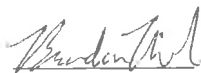
Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 29.5 tons per 12 consecutive month

Reporting Period Dates: From 04/01/2013 To 06/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	1	0.05
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% 02 30 Day

Emission Limitation: 60 ppm

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:	4	0.18
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.18

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:	0	0.00
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 27.5 tons per 12 consecutive month

Reporting Period Dates: From 04/01/2013 To 06/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit:

Total Source Operating Time in Reporting Period: 185 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	4	0.18
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.18

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOX

Emission Limitation: 7.3 tons per 12 consecutive month period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc. - Whiting Bus

Address: 2815 Indianapolis Blvd, Whiting IN 46307

Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 09/20/2013 (CGA)

Total Source Operating Time in Reporting Period: 2136 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

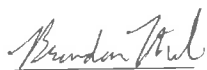
Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 7.3 tons per 12 consecutive month period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc. - Whiting Bus

Address: 2815 Indianapolis Blvd, Whiting IN 46307

Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 09/20/2013 (CGA)

Total Source Operating Time in Reporting Period: 2136 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H<sub>2</sub>S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: South Flare

Date of Last CEMS Certification or Audit: 09/25/2013 (CGA)

Total Source Operating Time in Reporting Period: 1072 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	2	0.09
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS

Emission Limitation: N/A

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: South Flare

Date of Last CEMS Certification or Audit: 09/25/2013 (CGA)

Total Source Operating Time in Reporting Period: 1072 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	2	0.09
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

Brandon Mik

SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35**

**Pollutant: Total Reduced Sulfur (TRS)  
Emission Limit: 250 ppm (12 Hour Rolling Average)  
Date of Latest CEMS Certification or Audit: 09/16/2013 (CGA)**

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Beavon Stretford Tail Gas Unit (B/S TGU)

Total source operating time in reporting period: **2160.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	16.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	16.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.74%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. "

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K

Signature: Brandon M. K

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: SO2  
Emission Limit: 250 ppm ( 3-hr average)  
Date of Latest CEMS Certification or Audit: 09/10/2013 (CGA)

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Sodium Bisulfite Tail Gas Unit (SBS TGU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	3.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	3.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.17%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K

Signature: Brandon Phil

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: SO2  
Emission Limit: 250 ppm (12 Hour Rolling Average)  
Date of Latest CEMS Certification or Audit: 09/10/2013 (CGA)

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Sodium Bisulfite Tail Gas Unit (SBS TGU)

Total source operating time in reporting period: 1798.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	3.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	3.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.17%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mik

Signature: Brandon Mik

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: SO2  
Emission Limit: 250 ppm (12 Hour Rolling Average)  
Date of Latest CEMS Certification or Audit:

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Sulfur Recovery Unit Standby Incinerator

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	8.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	8.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.36%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K

Signature: Brandon Phil

Title: Environmental Engineer

Date: 10/25/2013

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 55.0 tons per 12 consecutive month

Reporting Period Dates: From 07/01/2013 To 09/30/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Tail Gas Unit A

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 538 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	4	0.73
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.73

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: SO<sub>2</sub> @ 0% O<sub>2</sub> 12-Hour  
Emission Limitation: 250 ppm  
Reporting Period Dates: From 07/01/2013 To 09/30/2013  
Company Name: BP Products North America, Inc.  
Address: Whiting Refinery  
Process Unit Description: Tail Gas Unit A  
Date of Last CEMS Certification or Audit: N/A  
Total Source Operating Time in Reporting Period: 538 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	4	0.73
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.73

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

10/25/2013

DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19

Pollutant: NOx

Emission Limit: 80 ppm (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 08/07/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: 2159.6 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	16.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	50.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	66.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	3.06%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MinkSignature: Brandon Mink

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

**Pollutant: NOx  
Emission Limit: 40 ppm (365-Day Rolling Average)  
Date of Latest CEMS Certification or Audit: 08/07/2013 (RATA)**

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2159.6 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	16.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	50.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	66.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	3.06%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Molk

Signature: Brandon Molk

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19

Pollutant: CO

Emission Limit: 500 ppm (1 Hour Block Average)

Date of Latest CEMS Certification or Audit: 08/07/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: 2159.6 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	16.0
c. Process Problems.....	2.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	38.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	2.0	2. Total duration of CEMS downtime.....	54.0
3. Excess emission duration (%).....	0.09%	3. CEMS downtime (%).....	2.50%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. KSignature: Brandon M. K

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

Pollutant: SO2

Emission Limit: 50 PPM (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 08/07/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2159.6 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	27.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	58.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	85.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	3.94%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.KSignature: Brandon M.K

Title: Environmental Engineer

Date: 10/23/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

**Pollutant: SO2**

**Emission Limit: 25 ppm (365-Day Rolling Average)**

**Date of Latest CEMS Certification or Audit: 08/07/2013 (RATA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2159.6 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	27.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	58.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	85.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	3.94%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MK

Signature: Brandon MK

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19

Pollutant: NOx

Emission Limit: 40 ppm (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 08/06/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name:

Brandon M. K.

Signature:

Brandon M. K.

Title:

Environmental Engineer

Date:

10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19

Pollutant: NOx

Emission Limit: 20 ppm (365-day rolling average)

Date of Latest CEMS Certification or Audit: 08/06/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MirkSignature: Brandon Mirk

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

**Pollutant: CO**  
**Emission Limit: 500 ppm (1 Hour Block Average)**  
**Date of Latest CEMS Certification or Audit: 08/06/2013 (RATA)**

Company Name: BP Products North America, Inc.  
 Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
 Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mink

Signature: Brandon Mink

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

**Pollutant: SO2**

**Emission Limit: 125 ppm (7-Day Rolling Average)**

**Date of Latest CEMS Certification or Audit: 08/06/2013 (RATA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K.

Signature: Brandon M. K.

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:19**

**Pollutant: SO2**  
**Emission Limit: 50 ppm (365-Day Rolling Average)**  
**Date of Latest CEMS Certification or Audit: 08/06/2013 (RATA)**

Company Name: BP Products North America, Inc.  
 Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
 Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K

Signature: Brandon M.K

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 07/22/2013 (Linearity)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 31

Total source operating time in reporting period: 2208.0 hours

**Emission Data Summary(note 1 )**

1. Duration of excess emissions in period due to:	
a. Start Up/Shut Down.....	0.0
b. Control Equipment Failure.....	0.0
c. Process Problems.....	0.0
d. Other Known Excess Emissions Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0
2. Total duration of excess emission.....	0.0
3. Excess emission duration (%).....	0.00%

**CEMS Downtime Summary(note 1 )**

1. Duration of CEMS downtime in period due to:	
a. Monitoring Equipment Malfunction.....	0.0
b. Non-Monitoring Equipment Malfunction...	0.0
c. Quality Assurance.....	3.0
d. Other Known Monitor Downtime Cause.....	2.0
e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of CEMS downtime.....	5.0
3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours. For opacity, record all times in minutes.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K.Signature: Brandon M. K.

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01

Pollutant: NOx  
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)  
Date of Latest CEMS Certification or Audit: 07/11/2013 (Linearity)

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: 3sps Boiler 32

Total source operating time in reporting period: 1766.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

- 1 For gases, record all times in hours. For opacity, record all times in minutes.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mirk

Signature: Brandon Mirk

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01**

**Pollutant: NOx  
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)  
Date of Latest CEMS Certification or Audit: 07/11/2013 (Linearity)**

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: 3sps Boiler 33

Total source operating time in reporting period: **1032.0 hours**

**Emission Data Summary(note 1 )****CEMS Downtime Summary(note 1 )**

1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.10%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours. For opacity, record all times in minutes.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K

Signature: Brandon M. K

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 07/24/2013 (Linearity)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 34

Total source operating time in reporting period: 936.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K.

Signature: Brandon M.K.

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01

Pollutant: NOx  
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)  
Date of Latest CEMS Certification or Audit: 07/25/2013 (Linearity)

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: 3sps Boiler 36

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	2.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	2.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):

- 1 For gases, record all times in hours. For opacity, record all times in minutes.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K

Signature: Brandon M.K

Title: Environmental Engineer

Date: 10/25/2013

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:01**

**Pollutant: CO**

**Emission Limit: 260.4 tons per 12 consecutive month total**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boilers 31, 32, 33, 34 & 36

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	6.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	8.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.36%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

**Note(s):**

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.K

Signature: Brandon Phil

Title: Environmental Engineer

Date: 10/25/2013

## **Attachment B**

### **Excess Emission and CEMS Downtime Report per 325 IAC 3-5-7 and 40 CFR 60.7(c)**

Facility Name: BP Products North America, Inc.

Source: CFU

Parameter: H2S - 3 hr

Location: Whiting Refinery

Limit: 162

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 10/21/13 11:28:09

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: CFU

Parameter: H2S - 365 Day Limit: 60

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 10/21/13 11:28:14

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:37

Pollutant: H2S\_CRU Episode: H2S CRU Analyzer Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
-------------------	-----------------	-------------------	-------	-------	------------------	-------------------

No H2S CRU Analyzer Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:37

Pollutant: H2S365\_CRU Episode: H2S CRU Analyzer Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No H2S CRU 365d Excess during the Report Period

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery  
 Source: No. 4 Ultraformer  
 Parameter: H2S - 3 hr Limit: 162  
 Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 10/21/13 11:27:03

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 365 Day Limit: 60

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 10/21/13 11:27:10

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:37

Pollutant: H2S\_DDU    Episode: H2S DDU Analyzer Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
-------------------	-----------------	-------------------	-------	-------	------------------	-------------------

No H2S DDU Analyzer Excess    during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: H2S\_SRU Episode: SRU H2S Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
-------------------	-----------------	-------------------	-------	-------	------------------	-------------------

No SRU H2S Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:37

Pollutant: H2S365\_SRU Episode: SRU H2S 365d Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No SRU H2S 365d Excess during the Report Period

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater H-101A

Limit: 60

Parameter: NOX @ 0% O2 30 Day

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 10/21/13 11:37:08

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater H-101A

Limit: 29.5 tons

Parameter: CO per 12 consecutive month

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
NO Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 319 hours  
 Report Printed on: 10/21/13 11:37:16

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater H-101B

Parameter: NOX @ 0% O2 30 Day

Limit: 60

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 10/21/13 11:38:47

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO per 12 consecutive month

Limit: 29.5 tons

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 273 hours  
Report Printed on: 10/21/13 11:38:56

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX @ 0% O2 30 Day Limit: 60

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:40:34

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: CO per 12 consecutive month Limit: 27.5 tons

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 185 hours  
 Report Printed on: 10/21/13 11:40:39

# Excess Emissions Report

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Facility Name: BP Products North America, Inc. - Whiting Bus

Source: DHT

Parameter: NOX Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2136 hours  
 Report Printed on: 10/21/13 11:50:47

# Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2136 hours

Report Printed on: 10/21/13 11:50:45

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: South Flare

Parameter: H2S ppmvd 3-hr Limit: 162

Data in the Reporting Period: 04/01/13 to 06/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 1072 hours

Report Printed on: 07/05/13 13:35:03

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: TRS\_TGU Episode: TRS TGU 12 hr Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No TRS TGU 12 hr Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: SO2COR\_SBS Episode: SBS SO2 12 hr Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No SBS SO2 Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: SO2COR\_INC Episode: SRU SO2 Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No SRU SO2 Excess during the Report Period

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO per 12 consecutive month

Limit: 55.0 tons

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 538 hours

Report Printed on: 10/23/13 08:09:51

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 @ 0% O2

Limit: 250.0

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 538 hours

Report Printed on: 10/23/13 08:09:51

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:23

Pollutant: NOx\_7DyBP5 Episode: FCU 500 NOx Excess 7 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 500 NOx Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:23

Pollutant: NOx\_365BP5 Episode: FCU 500 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 500 NOx Excess 365 Day during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:22

Pollutant: CO\_5 Episode: FCU 500 CO Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
09/10/2013 10:00	09/10/2013 10:59	1	773.0	500.0	FCU 500 experienced a unit upset from water in the fresh feed resulting in a trip of the ESPs.	Clean, fresh feed was restored to the unit. Unit was restored to stable operations and ESPs were re-energized.
09/10/2013 11:00	09/10/2013 11:59	1	876.9	500.0		

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:24

Pollutant: SO2\_7dyBP5    Episode: FCU 500 SO2 Excess 7 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 500 SO2 Excess 7 Day    during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:24

Pollutant: SO2\_365BP5 Episode: FCU 500 SO2 Excess 365 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 500 SO2 Excess 365 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:24

Pollutant: NOx\_7DyBP6 Episode: FCU 600 NOx Excess 7 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 600 NOx Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:24

Pollutant: NOx\_365BP6 Episode: FCU 600 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 600 NOx Excess 365 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:23

Pollutant: CO\_6 Episode: FCU 600 CO Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 600 CO Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:25

Pollutant: SO2\_7dyBP6 Episode: FCU 600 SO2 Excess 7 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 600 SO2 Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:25

Pollutant: SO2\_365BP6 Episode: FCU 600 SO2 Excess 365 Day

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No FCU 600 SO2 Excess 365 Day during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: NOxlbmY\_31    Episode: Unit 31 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No Unit 31 NOx lbmmbtu 365 day Excess    during the Report Period

## Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:02

Pollutant: NOxlbmy\_32 Episode: Unit 32 NOx lbmbbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No Unit 32 NOx lbmbbtu 365 day Excess during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:02

Pollutant: NOxlbmY\_33    Episode: Unit 33 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No Unit 33 NOx lbmmbtu 365 day Excess    during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: NOxlbmy\_34    Episode: Unit 34 NOx lbmbmtu 365 day Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
No Unit 34 NOx lbmbmtu 365 day Excess    during the Report Period						

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: NOxlbmy\_36    Episode: Unit 36 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No Unit 36 NOx lbmmbtu 365 day Excess during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:01

Pollutant: CO Tons/Year      Episode: CO Tons/Year

Incident Start	Incident End	Duration Hours	Value	Limit	Cause of Episode	Corrective Action
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No CO Tons/Year during the Report Period

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	08/15/13 05:00:41	08/15/13 06:59:40	2	d. Other known cause	Analyzer had "DO Failure" alarm during morning cal check. Cleared alarm and ran another cal check. passed at 0801.	Analyzer had "DO Failure" alarm during morning cal check. Cleared alarm and ran another cal check. passed at 0801.
2	09/09/13 05:00:41	09/10/13 12:59:40	32	b. Non-monitor equipment malfunction	Analyzer went into fault due to low plant N2. Connected bottled N2. Cycled analyzer power to reset. Cal check passed at 1349 on 9/10/13.	Analyzer went into fault due to low plant N2. Connected bottled N2. Cycled analyzer power to reset. Cal check passed at 1349 on 9/10/13.
3	09/17/13 12:00:41	09/17/13 12:59:41	1	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit
4	09/29/13 01:00:39	09/29/13 05:59:36	5	a. Monitor equipment malfunction	Fault alarm. Cleared by analyzer re-boot. Daily cal check ran after system temps and pressures stabilized. passed.	Fault alarm. Cleared by analyzer re-boot. Daily cal check ran after system temps and pressures stabilized. passed.

Total Downtime in the Reporting Period = 40 hours , Data Availability for this Reporting Period = 98.19 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:28:03

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: CFU

Parameter: TS CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:27:59

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:35

Pollutant: H2S\_CRU Episode: H2S CRU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/20/2013 14:00	08/20/2013 15:59	2	b. Non-monitor equipment malfunction	Shelter HVAC failed causing alarms for shelter and analyzer. Disabled alarms at analyzer until HVAC repaired. Cal check passed and back in service at 1725

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 2.0 Hours

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	08/20/13 23:00:40	08/21/13 04:59:41	6	a. Monitor equipment malfunction	Fault alarm. #682 database I/O failure. Reset alarm - ran cal check. All is good.	Fault alarm. #682 database I/O failure. Reset alarm - ran cal check. All is good.
2	09/17/13 09:00:40	09/17/13 09:59:40	1	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 6 hours , Data Availability for this Reporting Period = 99.73 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:26:53

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: TS CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:26:45

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: H2S\_DDU Episode: H2S DDU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/01/2013 07:00	07/01/2013 08:59	2	d. Other known cause	Single bad morning cal check. Adjusted bottle pressures and ran cal checks in maintenance mode. In maintenance mode from 0713-0915. Final cal check from 0923-0949. passed
07/15/2013 04:00	07/16/2013 18:59	39	d. Other known cause	Double bad cal failure. Sample system hit by unit upset. Performed sample system maintenance. Also had to replace columns and sample valve. Adjusted valve and heartbeat timings and also adjusted DAHS settle times. Cal check passed.
07/28/2013 08:00	07/30/2013 08:59	49	d. Other known cause	Analyzer reading flatlined at zero. Low cal gas reading a little low. Recalibrated analyzer. Ran cal check. passed.
07/30/2013 10:00	07/30/2013 11:59	2	d. Other known cause	Double bad cal check. No peaks on analyzer. retightened valves to proper torque. Ran cal gas and failed again. Checked cal gas snapshot times. Ran cal check from 1143-1202. passed.
07/30/2013 14:00	07/30/2013 18:59	5	d. Other known cause	Double bad cal check. No peaks on analyzer. retightened valves to proper torque. Ran cal gas and failed again. Checked cal gas snapshot times. Ran cal check from 1143-1202. passed.

## Episode List Report

BP Products North America, Inc

2815 Indianapolis

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:36

Pollutant: H2S\_DDU Episode: H2S DDU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/31/2013 08:00	07/31/2013 09:59	2	d. Other known cause	Cleaned sample line and sample conditioner. Rebuilt pump. Maintenance mode from 1903-1959. Cal check from 2008-2027. passed
07/31/2013 19:00	07/31/2013 19:59	1	d. Other known cause	Cleaned sample line and sample conditioner. Rebuilt pump. Maintenance mode from 1903-1959. Cal check from 2008-2027. passed

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 100.0 Hours

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:36

Pollutant: H2S\_SRU    Episode: SRU H2S Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SRU H2S Analyzer Downtime during the Report Period

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/20/13 08:00:37	09/20/13 08:59:37	1	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:36:55

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater H-101A

Parameter: CO CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/20/13 08:00:37	09/20/13 08:59:37	1	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:36:49

Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater H-101B

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/20/13 08:00:39	09/20/13 08:59:39	1	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 1 hours ; Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:38:38

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/20/13 08:00:39	09/20/13 08:59:39	1	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:38:33

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/18/13 07:00:37	09/18/13 09:59:39	3	a. Monitor equipment malfunction	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.
2	09/18/13 11:00:40	09/18/13 11:59:40	1	a. Monitor equipment malfunction	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.82 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:40:20

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: CO CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/18/13 07:00:37	09/18/13 09:59:39	3	a. Monitor equipment malfunction	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.
2	09/18/13 11:00:40	09/18/13 11:59:40	1	a. Monitor equipment malfunction	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.	Calibrated analyzer because NOX and CO were off. MLT output was malfunctioning so reset and returned to normal. Ran CGA, failed due to recovery times; changed them and second CGA passed.

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.82 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:40:13

# Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:50:42

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:50:38

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/25/13 08:00:38	09/25/13 09:59:38	2	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:41:52

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: TS Analyzer

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	07/31/13 08:00:36	07/31/13 09:59:41	2	d. Other known cause	Maintenance mode 740-1115. Changed tubing in oven to redirect flow path for Low/High range to preserve valves. Powered analyzer down to accomplish. Powered up, ran cal 1119-1145, passed.	Maintenance mode 740-1115. Changed tubing in oven to redirect flow path for Low/High range to preserve valves. Powered analyzer down to accomplish. Powered up, ran cal 1119-1145, passed.

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 10/21/13 11:41:48

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:36

Pollutant: TRS\_TGU Episode: TRS TGU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/13/2013 06:00	08/13/2013 21:59	16	a. Monitor equipment malfunction	Analyzer power supply failed. Replaced power supply. Ran cal check. Analyzer back in service at 11pm.

Total Reported Time: 2160.0 Hours

TOTAL DURATION: 16.0 Hours

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:35

Pollutant: SO2COR\_SBS Episode: SBS SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
09/10/2013 11:00	09/10/2013 13:59	3	d. Other known cause	Had a keypad failure while trying to run CGA. Replaced keypad. Recalibrated analyzer. Ran CGA. Analyzer back in service at 1627.

Total Reported Time: 1798.0 Hours

TOTAL DURATION: 3.0 Hours

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:36

Pollutant: SO2RAW\_IN Episode: SRU Incinerator SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/17/2013 23:00	08/18/2013 06:59	8	b. Non-monitor equipment malfunction	Refinery power blip. Had to reset power to sample line and probe heaters. Ran cal check when stable. Passed. Back in service at 0855.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 8.0 Hours

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/17/13 03:00:37	09/17/13 06:59:41	4	c. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.26 %

Total Operating Time in the Reporting Period = 538 hours

Report Printed on: 10/23/13 08:09:44

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 CEMS

Data in the Reporting Period: 07/01/13 to 09/30/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	09/17/13 03:00:37	09/17/13 06:59:41	4	C. Quality assurance calibration	Ran cylinder gas audit	Ran cylinder gas audit

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.26 %

Total Operating Time in the Reporting Period = 538 hours

Report Printed on: 10/23/13 08:09:48

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:19

Pollutant: NOx\_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/20/2013 08:00	07/20/2013 08:59	1	1 d. Other known cause	Single bad cal check. Adjusted analyzer calibrations. Ran cal check 0837-0901. passed
07/21/2013 10:00	07/21/2013 10:59	1	1 d. Other known cause	Low pressure alarms. Changed scrubber at probe. Repaired tubing leak at probe box. 1149 cal check good. 1210 back in service.
07/22/2013 12:00	07/22/2013 16:59	5	5 d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/22/2013 18:00	07/22/2013 20:59	3	3 d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/30/2013 08:00	07/30/2013 08:59	1	1 d. Other known cause	Manual calibration checks were off. Blew back sample line and washed pump. Calibrated analyzers to sample line. Maintenance mode from 0722-0847. Cal check from 0849-0912. passed.

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:19

Pollutant: NOx\_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/01/2013 08:00	08/01/2013 23:59	16	d. Other known cause	Adjusted sample pressure. Blew back sample line and flushed the pump. Zeroed and calibrated analyzers. Maint mode from 0821-0911. Cal check from 0917-0940. passed
08/02/2013 02:00	08/02/2013 02:59	1	d. Other known cause	Lost sample pressure. replaced ammonia scrubber and tubing in probe box. Ran cal check at 0249. passed with single bads on SO2 and CO. Maintenance mode (0746-0847) to calibrate SO2 and NOX. Cal check from 0900 to 0923. passed.
08/02/2013 08:00	08/02/2013 08:59	1	d. Other known cause	maintenance mode to check sample system 0736-0808. Ran cal check. Single bad on SO2. Maintenance mode from 0855-1032 to blow back and water wash sample line. Checked for leaks and reset pump pressure and flows. Ran cal check from 1035-1058. Passed.
08/04/2013 09:00	08/04/2013 09:59	1	d. Other known cause	Maintenance mode from 0734-0920 to wash sample line and flush pump.. Also changed scrubber at probe. Cal check from 0923-0946. passed.
08/07/2013 08:00	08/07/2013 08:59	1	d. Other known cause	Connected old sample line to prepare for replacement of plugged sample lines. Maint mode from 0844-1048. Cal check from 1051-1115. passed.
08/12/2013 09:00	08/12/2013 10:59	2	d. Other known cause	No sample pressure. Replaced filter at tap and ammonia scrubber. Maint mode from 0517-0555. cal check from 0558-0621. passed.
08/14/2013 04:00	08/14/2013 05:59	2	d. Other known cause	

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: NOx\_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/14/2013 08:00	08/14/2013 11:59	4	d. Other known cause	New sample line in place. Turned on blow back, applied gas. tested good. Ran cal check. Maint mode 0800-1149. Cal check from 1155-1218. passed.
08/15/2013 09:00	08/15/2013 09:59	1	d. Other known cause	SO2 was a little low on cal check so went to Maintenance mode from 0907-0948. Adjusted bottle and pump pressure. Ran cal check from 0949-1011. Passed. Started automatic daily cal checks.
08/16/2013 16:00	08/16/2013 23:59	8	b. Non-monitor equipment malfunction	BBST breaker tripped. Sample line and probe heater not the cause. Moved wires to spare breaker in distribution panel. Sample line and probe heated up normally. Checked cal gas in maint. mode. Good. Took out of maintenance and ran cal check. Good
08/18/2013 00:00	08/18/2013 07:59	8	b. Non-monitor equipment malfunction	Refinery power blip cause loss of shunt trip breaker. Lost sample line and probe box heaters. Reset and allowed temps to stabilize. Ran cal check. Back in service at 0840 on 8/18/2013
08/20/2013 07:00	08/20/2013 07:59	1	d. Other known cause	Single bad on NOX. Maint mode from 0714-0821. Replaced ammonia scrubber at tap. Cal check from 0827-0851. passed.
09/01/2013 12:00	09/01/2013 12:59	1	d. Other known cause	Pump pressure dropped. replaced tubing from pump to chiller. changed ammonia scrubber at probe. Replaced scrubber tubing. Ran cal check at 1301.

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: NOx\_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
09/10/2013 12:00	09/10/2013 16:59	5	d. Other known cause	Unit upset caused sample system problems. Replace probe filter, changed ammonia scrubber at tap. Water washed sample line. Maint mode from 1515-1700. Analyzer taken out of service at 1736 due to unit being down.
09/24/2013 14:00	09/24/2013 16:59	3	d. Other known cause	Sample pressure alarm. Maintenance mode from 1508-1629. Replaced scrubber at probe, water washed sample line. Cal check from 1637-1659. passed.

Total Reported Time: 2159.6 Hours

TOTAL DURATION: 66.0 Hours

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: CO\_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/20/2013 08:00	07/20/2013 08:59	1	d. Other known cause	Single bad cal check. Adjusted analyzer calibrations. Ran cal check 0837-0901. passed
07/21/2013 10:00	07/21/2013 10:59	1	d. Other known cause	Low pressure alarms. Changed scrubber at probe. Repaired tubing leak at probe box. 1149 cal check good. 1210 back in service.
07/22/2013 12:00	07/22/2013 16:59	5	d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/22/2013 18:00	07/22/2013 20:59	3	d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/30/2013 08:00	07/30/2013 08:59	1	d. Other known cause	Manual calibration checks were off. Blew back sample line and washed pump. Calibrated analyzers to sample line. Maintenance mode from 0722-0847. Cal check from 0849-0912. passed.
08/01/2013 08:00	08/01/2013 08:59	1	d. Other known cause	Adjusted sample pressure. Blew back sample line and flushed the pump. Zeroed and calibrated analyzers. Maint mode from 0821-0911. Cal check from 0917-0940. passed

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: CO\_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/01/2013 18:00	08/01/2013 20:59	3	d. Other known cause	Lost sample pressure. Pump OK. Replaced probe filter and pressure was good but not stable. Left for next crew.
08/02/2013 02:00	08/02/2013 02:59	1	d. Other known cause	Lost sample pressure. replaced ammonia scrubber and tubing in probe box. Ran cal check at 0249. passed with single bads on SO2 and CO.
08/02/2013 08:00	08/02/2013 08:59	1	d. Other known cause	Maintenance mode (0746-0847) to calibrate SO2 and NOX. Cal check from 0900 to 0923. passed.
08/04/2013 09:00	08/04/2013 09:59	1	d. Other known cause	maintenance mode to check sample system 0736-0808. Ran cal check. Single bad on SO2. Maintenance mode from 0855-1032 to blow back and water wash sample line. Checked for leaks and reset pump pressure and flows. Ran cal check from 1035-1058. Passed.
08/07/2013 08:00	08/07/2013 08:59	1	d. Other known cause	Maintenance mode from 0734-0920 to wash sample line and flush pump.. Also changed scrubber at probe. Cal check from 0923-0946. passed.
08/12/2013 09:00	08/12/2013 10:59	2	d. Other known cause	Connected old sample line to prepare for replacement of plugged sample lines. Maint mode from 0844-1048. Cal check from 1051-1115. passed.
08/14/2013 04:00	08/14/2013 05:59	2	d. Other known cause	No sample pressure. Replaced filter at tap and ammonia scrubber. Maint mode from 0517-0555. cal check from 0558-0621. passed.
08/14/2013 08:00	08/14/2013 11:59	4	d. Other known cause	New sample line in place. Turned on blow back, applied gas. tested good. Ran cal check. Maint mode 0800-1149. Cal check from 1155-1218. passed.

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: CO\_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/15/2013 09:00	08/15/2013 09:59	1	d. Other known cause	S02 was a little low on cal check so went to Maintenance mode from 0907-0948. Adjusted bottle and pump pressure. Ran cal check from 0949-1011. Passed. Started automatic daily cal checks.
08/16/2013 16:00	08/16/2013 23:59	8	b. Non-monitor equipment malfunction	BBST breaker tripped. Sample line and probe heater not the cause. Moved wires to spare breaker in distribution panel. Sample line and probe heated up normally. Checked cal gas in maint. mode. Good. Took out of maintenance and ran cal check. Good
08/18/2013 00:00	08/18/2013 07:59	8	b. Non-monitor equipment malfunction	Refinery power blip cause loss of shunt trip breaker. Lost sample line and probe box heaters. Reset and allowed temps to stabilize. Ran cal check. Back in service at 0840 on 8/18/2013
08/20/2013 07:00	08/20/2013 07:59	1	d. Other known cause	Single bad on NOX. Maint mode from 0714-0821. Replaced ammonia scrubber at tap. Cal check from 0827-0851. passed.
09/01/2013 12:00	09/01/2013 12:59	1	d. Other known cause	Pump pressure dropped. replaced tubing from pump to chiller. changed ammonia scrubber at probe. Replaced scrubber tubing. Ran cal check at 1301.
09/10/2013 12:00	09/10/2013 16:59	5	d. Other known cause	Unit upset caused sample system problems. Replace probe filter, changed ammonia scrubber at tap. Water washed sample line. Maint mode from 1515-1700. Analyzer taken out of service at 1736 due to unit being down.

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:19

Pollutant: CO\_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
09/24/2013 14:00	09/24/2013 16:59	3	d. Other known cause	Sample pressure alarm. Maintenance mode from 1508-1629. Replaced scrubber at probe, water washed sample line. Cal check from 1637-1659. passed.

Total Reported Time: 2159.6 Hours  
TOTAL DURATION: 54.0 Hours

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: SO2\_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/20/2013 08:00	07/20/2013 08:59	1	d. Other known cause	Single bad cal check. Adjusted analyzer calibrations. Ran cal check 0837-0901. passed
07/21/2013 10:00	07/21/2013 10:59	1	d. Other known cause	Low pressure alarms. Changed scrubber at probe. Repaired tubing leak at probe box. 1149 cal check good. 1210 back in service.
07/22/2013 12:00	07/22/2013 16:59	5	d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/22/2013 18:00	07/22/2013 20:59	3	d. Other known cause	Sample lines plugged. Used blowback line for sample gas. Replaced probe filter but could not get old gasket out. reinstalled filter and calibrated analyzers. Left automatic cal check off to allow time for system checks in the AM. Back in service
07/30/2013 08:00	07/30/2013 08:59	1	d. Other known cause	Manual calibration checks were off. Blew back sample line and washed pump. Calibrated analyzers to sample line. Maintenance mode from 0722-0847. Cal check from 0849-0912. passed.
08/01/2013 08:00	08/01/2013 23:59	16	d. Other known cause	Adjusted sample pressure. Blew back sample line and flushed the pump. Zeroed and calibrated analyzers. Maint mode from 0821-0911. Cal check from 0917-0940. passed

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: SO2\_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/02/2013 02:00	08/02/2013 02:59	1	d. Other known cause	Lost sample pressure. replaced ammonia scrubber and tubing in probe box. Ran cal check at 0249. passed with single bads on SO2 and CO. Maintenance mode (0746-0847) to calibrate SO2 and NOX. Cal check from 0900 to 0923. passed. maintenance mode to check sample system 0736-0808. Ran cal check. Single bad on SO2. Maintenance mode from 0855-1032 to blow back and water wash sample line. Checked for leaks and reset pump pressure and flows. Ran cal check from 1035-1058. Passed.
08/02/2013 08:00	08/02/2013 08:59	1	d. Other known cause	Maintenance mode from 0734-0920 to wash sample line and flush pump.. Also changed scrubber at probe. Cal check from 0923-0946. passed. Connected old sample line to prepare for replacement of plugged sample lines. Maint mode from 0844-1048. Cal check from 1051-1115. passed. No sample pressure. Replaced filter at tap and ammonia scrubber. Maint mode from 0517-0555. cal check from 0558-0621. passed.
08/04/2013 09:00	08/04/2013 09:59	1	d. Other known cause	New sample line in place. Turned on blow back, applied gas. tested good. Ran cal check. Maint mode 0800-1149. Cal check from 1155-1218. passed.
08/07/2013 08:00	08/07/2013 08:59	1	d. Other known cause	
08/12/2013 09:00	08/12/2013 10:59	2	d. Other known cause	
08/14/2013 04:00	08/14/2013 05:59	2	d. Other known cause	
08/14/2013 08:00	08/14/2013 11:59	4	d. Other known cause	

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:19

Pollutant: SO2\_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/15/2013 09:00	08/15/2013 09:59	1	d. Other known cause	SO2 was a little low on cal check so went to Maintenance mode from 0907-0948. Adjusted bottle and pump pressure. Ran cal check from 0949-1011. Passed. Started automatic daily cal checks.
08/16/2013 16:00	08/16/2013 23:59	8	b. Non-montior equipment malfunction	BBST breaker tripped. Sample line and probe heater not the cause. Moved wires to spare breaker in distribution panel. Sample line and probe heated up normally. Checked cal gas in maint. mode. Good. Took out of maintenance and ran cal check. Good
08/17/2013 05:00	08/17/2013 23:59	19	b. Non-montior equipment malfunction	Refinery power blip cause loss of shunt trip breaker. Lost sample line and probe box heaters. Reset and allowed temps to stabilize. Ran cal check. Back in service at 0840 on 8/18/2013
08/18/2013 00:00	08/18/2013 07:59	8	d. Other known cause	Refinery power blip cause loss of shunt trip breaker. Lost sample line and probe box heaters. Reset and allowed temps to stabilize. Ran cal check. Back in service at 0840 on 8/18/2013
08/20/2013 07:00	08/20/2013 07:59	1	d. Other known cause	Single bad on NOX. Maint mode from 0714-0821. Replaced ammonia scrubber at tap. Cal check from 0827-0851. passed.
09/01/2013 12:00	09/01/2013 12:59	1	d. Other known cause	Pump pressure dropped. replaced tubing from pump to chiller. changed ammonia scrubber at probe. Replaced scrubber tubing. Ran cal check at 1301.

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:19

Pollutant: SO2\_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
09/10/2013 12:00	09/10/2013 16:59	5	d. Other known cause	Unit upset caused sample system problems. Replace probe filter, changed ammonia scrubber at tap. Water washed sample line. Maint mode from 1515-1700. Analyzer taken out of service at 1736 due to unit being down.
09/24/2013 14:00	09/24/2013 16:59	3	d. Other known cause	Sample pressure alarm. Maintenance mode from 1508-1629. Replaced scrubber at probe, water washed sample line. Cal check from 1637-1659. passed.

Total Reported Time: 2159.6 Hours

TOTAL DURATION: 85.0 Hours

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:22

Pollutant: NOx\_6    Episode: 600 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No 600 NOx Analyzer Downtime    during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:21

Pollutant: CO\_6 Episode: 600 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No 600 CO Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:22

Pollutant: SO2\_6 Episode: 600 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No 600 SO2 Analyzer Downtime during the Report Period				
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Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: NOx\_31 Episode: Unit 31 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/22/2013 07:00	07/22/2013 08:59	2	c. Quality assurance calibration	Ran linearity test
07/22/2013 10:00	07/22/2013 10:59	1	c. Quality assurance calibration	Ran linearity test
08/07/2013 05:00	08/07/2013 06:59	2	d. Other known cause	Recalibrated Nox Low Analyzer. Ran cal check from 0658-0717. Passed

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: CO\_31 Episode: Unit 31 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/22/2013 07:00	07/22/2013 08:59	2	c. Quality assurance calibration	Ran linearity test
07/22/2013 10:00	07/22/2013 10:59	1	c. Quality assurance calibration	Ran linearity test

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 3.0 Hours

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: NOx\_32    Episode: Unit 32 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 32 NOx Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: CO\_32    Episode: Unit 32 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 32 CO Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: NOx\_33 Episode: Unit 33 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/11/2013 10:00	07/11/2013 10:59	1766.0 Hours	1 c. Quality assurance calibration	Ran linearity test

Total Reported Time: 1766.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: CO\_33 Episode: Unit 33 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/11/2013 10:00	07/11/2013 10:59		1 c. Quality assurance calibration	Ran linearity test

Total Reported Time: 1032.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: NOx\_34 Episode: Unit 34 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 34 NOx Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 7/1/2013 00:00 to 9/30/2013 23:59  
Generated: : 10/21/2013 10:02

Pollutant: CO\_34    Episode: Unit 34 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 34 CO Analyzer Downtime during the Report Period

## Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 7/1/2013 00:00 to 9/30/2013 23:59  
 Generated: : 10/21/2013 10:02

Pollutant: NOx\_36 Episode: Unit 36 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/11/2013 12:00	07/11/2013 12:59		1 d. Other known cause	Changed nox converter and ozonator bulb in CLD. Installed 32 blr cld temporarily while performing PMS. Cal check from 0835-0854. Passed Linearity checks. Had some configuration problems with CLD installation. Linearity test passed once configuration problems were corrected.
07/25/2013 12:00	07/25/2013 12:59		1 c. Quality assurance calibration	Linearity checks. Had some configuration problems with CLD installation. Linearity test passed once configuration problems were corrected.
07/25/2013 14:00	07/25/2013 14:59		1 c. Quality assurance calibration	Linearity checks. Had some configuration problems with CLD installation. Linearity test passed once configuration problems were corrected.
08/12/2013 06:00	08/12/2013 06:59		1 a. Monitor equipment malfunction	Recalibrated Analyzer(s)
08/27/2013 14:00	08/27/2013 14:59		1 a. Monitor equipment malfunction	HVAC failed and chiller could not keep up causing analyzer shelter alarm. Hvac was repaired and chiller replaced. Maintenance mode from 1329-1526 for repairs. Maint mode 1608-1627 to check calibration. Cal check at 1631, passed.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

## Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 7/1/2013 00:00 to 9/30/2013 23:59

Generated: : 10/21/2013 10:02

Pollutant: CO\_36 Episode: Unit 36 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/11/2013 12:00	07/11/2013 12:59	1	d. Other known cause	Changed nox converter and ozonator bulb in CLD. Installed 32 blr cld temporarily while performing PMS. Cal check from 0835-0854. Passed
07/25/2013 12:00	07/25/2013 12:59	1	c. Quality assurance calibration	Linearity checks. Had some configuration problems with CLD installation. Linearity test passed once configuration problems were corrected.
07/25/2013 14:00	07/25/2013 14:59	1	c. Quality assurance calibration	Linearity checks. Had some configuration problems with CLD installation. Linearity test passed once configuration problems were corrected.
08/27/2013 14:00	08/27/2013 14:59	1	a. Monitor equipment malfunction	HVAC failed and chiller could not keep up causing analyzer shelter alarm. Hvac was repaired and chiller replaced. Maintenance mode from 1329-1526 for repairs. Maint mode 1608-1627 to check calibration. Cal check at 1631, passed.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 4.0 Hours

## Attachment C

### Cylinder Gas Audit Results

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H <sub>2</sub> S	
CFU Fuel Drum	Total Sulfur	
CRU Fuel Drum	H <sub>2</sub> S	
CRU Fuel Drum	Total Sulfur	
4UF Fuel Drum	H <sub>2</sub> S	
4UF Fuel Drum	Total Sulfur	
DDU Flare	H <sub>2</sub> S	
SRU Mix Fuel Drum	H <sub>2</sub> S	
SRU Mix Fuel Drum	Total Sulfur	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
#2 Coker heater F-201	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-201	CO	Not included in this report because the unit has not yet started up.
#2 Coker heater F-202	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-202	CO	Not included in this report because the unit has not yet started up.
#2 Coker heater F-203	NO <sub>x</sub>	Not included in this report because the unit has not yet started up.
#2 Coker heater F-203	CO	Not included in this report because the unit has not yet started up.
12 PS heater H-101A	NO <sub>x</sub>	
12 PS heater H-101A	CO	
12 PS heater H-101B	NO <sub>x</sub>	
12 PS heater H-101B	CO	
12 PS heater H-102	NO <sub>x</sub>	
12 PS heater H-102	CO	
DHT heater B-601A	NO <sub>x</sub>	
DHT heater B-601A	CO	
GOHT Flare	H <sub>2</sub> S	Not included in this report because the unit has not yet started up.
GOHT Flare	Total Sulfur	Not included in this report because the unit has not yet started up.
South Flare	H <sub>2</sub> S	
South Flare	Total Sulfur	
B/S TGU	TRS	
SBS TGU	SO <sub>2</sub>	
SRU Standby Incinerator	SO <sub>2</sub>	
COT1	CO	Not included in this report because the unit started up, but has not been certified yet.
COT1	SO <sub>2</sub>	Not included in this report because the unit started up, but has not been certified yet.
COT2	CO	Not included in this report because the unit has not yet started up.
COT2	SO <sub>2</sub>	Not included in this report because the unit has not yet started up.

Location/Emission Unit	Parameter	Notes
FCU 500	NO <sub>x</sub>	Not included in this report because a RATA was performed during third quarter.
FCU 500	CO	Not included in this report because a RATA was performed during third quarter.
FCU 500	SO <sub>2</sub>	Not included in this report because a RATA was performed during third quarter.
FCU 600	NO <sub>x</sub>	Not included in this report because a RATA was performed during third quarter.
FCU 600	CO	Not included in this report because a RATA was performed during third quarter.
FCU 600	SO <sub>2</sub>	Not included in this report because a RATA was performed during third quarter.
3SPS Boiler 31 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 31 and Duct Burner 1	CO	
3SPS Boiler 32 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 32 and Duct Burner 2 <sup>2</sup>	CO	
3SPS Boiler 33 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 33 and Duct Burner 3 <sup>2</sup>	CO	
3SPS Boiler 34 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 34 and Duct Burner 4 <sup>2</sup>	CO	
3SPS Boiler 36 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 36 and Duct Burner 6 <sup>2</sup>	CO	

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

<sup>2</sup> The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

CFU H2S Audit Test Results Analyzer Span: 300.0 ppm

Mfr & Model: SIEMENS MAXUM

Serial Number: 001910

Low-Level Calibration Gas Concentration: 75.6  
(20-30% of Span) Cylinder No.: CC411623  
( 60.0 ppm - 90.0 ppm) Expiration Date: 09/04/16

Mid-Level Calibration Gas Concentration: 157.9  
(50-60% of Span) Cylinder No.: CC431414  
( 150.0 ppm - 180.0 ppm) Expiration Date: 05/01/16

Test Date: 09/17/13

Tester: At



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	12:12:12	79.1	12:23:52	166.4
Run 2	12:35:28	79.6	12:47:04	164.7
Run 3	12:58:40	79.2	13:10:13	165.0
Avg. Monitor Response		79.3		165.4
Calibration Error	*	4.9		4.7
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

CFU TS Audit Test Results Analyzer Span: 400.0 ppm

Mfr & Model: SOLA 2

Serial Number: SL-07070111

Low-Level Calibration Gas  
(20-30% of Span)  
( 80.0 ppm - 120.0 ppm)

Concentration: 100.4  
Cylinder No.: CC409049  
Expiration Date: 08/21/15

Mid-Level Calibration Gas  
(50-60% of Span)  
( 200.0 ppm - 240.0 ppm)

Concentration: 222.5  
Cylinder No.: CC315968  
Expiration Date: 02/25/16

Test Date: 09/17/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	12:06:20	112.0	12:12:08	242.9
Run 2	12:33:40	113.9	12:39:32	240.4
Run 3	12:54:04	112.8	12:59:53	241.5
Avg. Monitor Response		107.4		223.9
Calibration Error	*	7.0		0.6
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack cru

BP Products North America, Inc.  
Generated: 9/16/2013

Period Start: 7/1/2013  
Period End: 9/16/2013  
Included Calibrations: (BP(P60):CGA)

Range of Analyzers:				Span of Analyzers:						
Date	Time	From	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Bottle ID	Expire Date
09/16/2013	13:27		H2S CRU	H2S	80.6	79.5	-1.1	-1.4	CC416792	10/3/2015
09/16/2013	13:27		H2S CRU	H2S	158.2	160.4	2.2	1.4	CC328128	4/24/2016
09/16/2013	12:56		H2S CRU	H2S	80.6	79.4	-1.2	-1.5	CC416792	10/3/2015
09/16/2013	12:56		H2S CRU	H2S	158.2	159.9	-1.7	1.1	CC328128	4/24/2016
09/16/2013	12:23		H2S CRU	H2S	80.6	79.4	-1.2	-1.5	CC416792	10/3/2015
09/16/2013	12:23		H2S CRU	H2S	158.2	160.0	1.8	1.1	CC328128	4/24/2016
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# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

4UF H2S Audit Test Results Analyzer Span: 300.0 ppm

Mfr & Model:

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 60.0 ppm - 90.0 ppm)

Concentration: 80.9  
Cylinder No.: CC201888  
Expiration Date: 12/12/15

Mid-Level Calibration Gas  
(50-60% of Span)  
( 150.0 ppm - 180.0 ppm)

Concentration: 159.4  
Cylinder No.: CC431429  
Expiration Date: 05/02/16

Test Date: 09/17/13

Tester:



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	09:07:35	81.0	09:19:12	166.1
Run 2	09:32:28	81.2	09:44:04	162.4
Run 3	09:57:20	80.9	10:08:56	165.3
Avg. Monitor Response		81.0		164.6
Calibration Error	*	0.1		3.3
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

4UF TS Audit Test Results Analyzer Span: 400.0 ppm

Mfr & Model: SOLA 2

Serial Number: SL07070111

Low-Level Calibration Gas  
(20-30% of Span)  
( 80.0 ppm - 120.0 ppm)

Concentration: 100.8  
Cylinder No.: CC268194  
Expiration Date: 09/04/16

Mid-Level Calibration Gas  
(50-60% of Span)  
( 200.0 ppm - 240.0 ppm)

Concentration: 217.9  
Cylinder No.: CC360612  
Expiration Date: 04/25/16

Test Date: 09/17/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	09:04:24	97.8	09:10:13	213.9
Run 2	09:23:05	100.2	09:28:57	213.8
Run 3	09:35:37	101.4	09:41:25	215.1
Avg. Monitor Response		99.8		214.3
Calibration Error		-1.0		-1.7
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor

BP Products North America, Inc.  
Generated: 9/3/2013

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack ddu

Period Start: 9/3/2013  
Period End: 9/3/2013  
Included Calibrations: (BP(P60):CGA)

Range of Analyzers:				Span of Analyzers:			
Date	Time	From	Channel	Type	Target	Actual	Diff
09/03/2013	10:52	3 Pt.	H2S DDU	H2S	0.0	300.0 ppm	H2S DDU
09/03/2013	10:52		H2S DDU	H2S	0.0	300.0 ppm	H2S
09/03/2013	10:15		H2S DDU	H2S	0.0	300.0 ppm	H2S
09/03/2013	10:15		H2S DDU	H2S	0.0	300.0 ppm	H2S
09/03/2013	09:36		H2S DDU	H2S	0.0	300.0 ppm	H2S
09/03/2013	09:36		H2S DDU	H2S	0.0	300.0 ppm	H2S

FAIL = Difference Error > Regulations Allow  
g Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Calibration (Absolute Average DIFF and Calibration % Error)

Channel				Diff			
H2S DDU	H2S	Units	%	Target	Diff	Target	%
		1.2	1.6%		5.3		3.3%

Performance Specification

Channel				MID			
H2S DDU	H2S	PASS	FAIL	PASS	FAIL	PASS	FAIL
		<=15.0%	>15.0%	<=15.0%	>15.0%	<=15.0%	>15.0%

[BP(P60):CGA H2S] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title: Analyzer Supervisor Signature: *Bill Hough* Date: 9/3/13

Title: Analyzer Supervisor Signature: *Bill Hough* Date: 9/3/13

# Babcock & Wilcox Power Generation Group NetDAHSE

Version 84.0

BP Products North America, Inc.  
Generated: 9/9/2013

Period Start: 7/1/2013  
Period End: 9/9/2013  
Included Calibrations: (BP (P60) :CGA)

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_sru

## Range of Analyzers:

## Span of Analyzers:

H2S\_SRU H2S 0.0 300.0 ppm H2S SRU H2S 0.0 300.0 ppm

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	Part	Bottle ID	Expire Date
09/06/2013	13:34	3 Pt.	H2S_SRU	LOW	77.3	76.7	-0.6	-0.8	15.0	CC351424	7/22/2016
09/06/2013	13:34		H2S_SRU	H2S	158.4	159.4	1.0	0.6	15.0	CC431437	5/2/2016
09/06/2013	13:00		H2S_SRU	MID	77.3	76.6	-0.7	-0.9	15.0	CC351424	7/22/2016
09/06/2013	13:00		H2S_SRU	LOW	158.4	159.0	0.6	0.4	15.0	CC431437	5/2/2016
09/06/2013	12:26		H2S_SRU	MID	77.3	76.2	-1.1	-1.4	15.0	CC351424	7/22/2016
09/06/2013	12:26		H2S_SRU	LOW	158.4	158.9	0.5	0.3	15.0	CC431437	5/2/2016

FAIL = Difference Error > Regulations Allow  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced



## Calibration (Absolute Average DIFF and Calibration % Error)

Channel	H2S	Diff	Target	Diff	Target
H2S_SRU	0.8	Units	1.0%	Units	0.7
					0.4%

## Performance Specification

Channel	H2S	LOW	MID
H2S_SRU	PASS	FAIL	FAIL
	<=15.0%	>15.0%	<=15.0%
			>15.0%

[BP (P60) :CGA H2S] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title: Analyzer Supervisor Signature:  Date: 9/9/13  
Title: Analyzer Tech Signature:  Date: 9/9/13

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101A NOx Audit Test Results Analyzer Span: 150.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 30.0 ppm - 45.0 ppm)

Concentration: 51.2  
Cylinder No.: CC403029  
Expiration Date: 06/28/14

Mid-Level Calibration Gas  
(50-60% of Span)  
( 75.0 ppm - 90.0 ppm)

Concentration: 83.6  
Cylinder No.: CC79050  
Expiration Date: 04/30/21

Test Date: 09/20/13

Tester: AT

*Allen Tuttle*

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:41:29	51.7	08:45:28	83.9
Run 2	08:58:52	51.6	09:02:52	83.8
Run 3	09:12:52	51.6	09:16:52	83.8
Avg. Monitor Response		51.6		83.8
Calibration Error	*	0.800		0.200
Absolute Difference		0.4		0.2
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

*[Signature]*

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101A CO Low Audit Test Results Analyzer Span: 100.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas Concentration: 24.7  
(20-30% of Span) Cylinder No.: CC401615  
( 20.0 ppm - 30.0 ppm) Expiration Date: 07/02/15

Mid-Level Calibration Gas Concentration: 54.3  
(50-60% of Span) Cylinder No.: CC409465  
( 50.0 ppm - 60.0 ppm) Expiration Date: 07/02/15

Test Date: 09/20/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:34:29	24.7	08:38:29	54.4
Run 2	08:51:49	26.3	08:55:52	55.1
Run 3	09:05:52	29.2	09:09:52	55.3
Avg. Monitor Response		26.7		54.9
Calibration Error	*	8.100		1.100
Absolute Difference		2.0		0.6
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101A CO High Audit Test Results Analyzer Span: 5000.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas Concentration: 1212.0  
(20-30% of Span) Cylinder No.: CC403029  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 09/20/13

Mid-Level Calibration Gas Concentration: 2660.0  
(50-60% of Span) Cylinder No.: CC79050  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 09/20/13

Test Date: 09/20/13

Tester: AT



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:41:29	1238.1	08:45:28	2709.4
Run 2	08:58:52	1237.2	09:02:52	2710.0
Run 3	09:12:52	1237.5	09:16:52	2709.4
Avg. Monitor Response		1237.6		2709.6
Calibration Error	*	2.100		1.900
Absolute Difference		25.6		49.6
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101B NOx Audit Test Results Analyzer Span: 150.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas Concentration: 51.2  
(20-30% of Span) Cylinder No.: CC403029  
( 30.0 ppm - 45.0 ppm) Expiration Date: 06/28/14

Mid-Level Calibration Gas Concentration: 83.6  
(50-60% of Span) Cylinder No.: CC79050  
( 75.0 ppm - 90.0 ppm) Expiration Date: 04/30/21

Test Date: 09/20/13

Tester: AT

*Allen Tuttle*

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:41:43	51.2	08:45:43	83.3
Run 2	08:59:15	51.2	09:03:15	83.2
Run 3	09:13:17	51.2	09:17:17	83.3
Avg. Monitor Response		51.2		83.3
Calibration Error	*	0.000		-0.400
Absolute Difference		0.0		0.3
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

*[Signature]*

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101B CO Low Audit Test Results Analyzer Span: 100.0 ppm

Mfr & Model: Rosemount

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 20.0 ppm - 30.0 ppm)

Concentration: 24.7  
Cylinder No.: CC401615  
Expiration Date: 07/02/15

Mid-Level Calibration Gas  
(50-60% of Span)  
( 50.0 ppm - 60.0 ppm)

Concentration: 54.3  
Cylinder No.: CC409465  
Expiration Date: 07/02/15

Test Date: 09/20/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:34:43	25.8	08:38:43	54.8
Run 2	08:52:15	26.0	08:56:15	54.9
Run 3	09:06:17	28.1	09:10:17	55.2
Avg. Monitor Response		26.6		55.0
Calibration Error	*	7.700		1.300
Absolute Difference		1.9		0.7
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-101B CO High Audit Test Results Analyzer Span: 5000.0 ppm

Mfr & Model: Rosemount

Serial Number:

Low-Level Calibration Gas Concentration: 1212.0  
(20-30% of Span) Cylinder No.: CC403029  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 06/28/15

Mid-Level Calibration Gas Concentration: 2660.0  
(50-60% of Span) Cylinder No.: CC79050  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 04/30/21

Test Date: 09/20/13

Tester: AT

*Allen Tattle*

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:41:43	1233.8	08:45:43	2715.0
Run 2	08:59:15	1230.3	09:03:15	2715.6
Run 3	09:13:17	1234.7	09:17:17	2713.4
Avg. Monitor Response		1232.9		2714.7
Calibration Error	*	1.700		2.100
Absolute Difference		20.9		54.7
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

*[Signature]*

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-102 NOx Audit Test Results Analyzer Span: 150.0 ppm

Mfr & Model: Rosemount CLD

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 30.0 ppm - 45.0 ppm)

Concentration: 51.1  
Cylinder No.: cc132026  
Expiration Date: 06/28/14

Mid-Level Calibration Gas  
(50-60% of Span)  
( 75.0 ppm - 90.0 ppm)

Concentration: 83.4  
Cylinder No.: SG9164919BAL  
Expiration Date: 08/14/21

Test Date: 09/18/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	13:03:12	50.3	13:07:13	81.8
Run 2	13:25:07	49.6	13:29:07	81.0
Run 3	13:44:07	49.5	13:48:07	80.7
Avg. Monitor Response		49.8		81.2
Calibration Error	-	-2.500		-2.600
Absolute Difference		1.3		2.2
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-102 CO Low Audit Test Results Analyzer Span: 100.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 20.0 ppm - 30.0 ppm)

Concentration: 24.7  
Cylinder No.: cc337885  
Expiration Date: 07/02/15

Mid-Level Calibration Gas  
(50-60% of Span)  
( 50.0 ppm - 60.0 ppm)

Concentration: 54.6  
Cylinder No.: cc409710  
Expiration Date: 07/02/15

Test Date: 09/18/13

Tester: AT



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	12:56:03	24.8	13:00:12	54.1
Run 2	13:18:11	25.3	13:22:07	54.2
Run 3	13:37:00	24.7	13:41:11	54.3
Avg. Monitor Response		24.9		54.2
Calibration Error	*	0.800		-0.700
Absolute Difference		0.2		0.4
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

H-102 CO High Audit Test Results Analyzer Span: 5000.0 ppm

Mfr & Model: Rosemount MLT

Serial Number:

Low-Level Calibration Gas Concentration: 1217.0  
(20-30% of Span) Cylinder No.: cc132026  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 06/28/14

Mid-Level Calibration Gas Concentration: 2765.0  
(50-60% of Span) Cylinder No.: SG9164919BAL  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 08/14/14

Test Date: 09/18/13

Tester: AT



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	13:03:12	1227.8	13:07:13	2719.4
Run 2	13:25:07	1227.5	13:29:07	2718.8
Run 3	13:44:07	1227.5	13:48:07	2720.3
Avg. Monitor Response		1227.6		2719.5
Calibration Error	*	0.900		-1.600
Absolute Difference		10.6		45.5
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT NOx Audit Test Results Analyzer Span: 100.00 ppm

Low-Level Calibration Gas Concentration: 25.45  
(20-30% of Span) Cylinder No.: CC140211  
( 20.00 ppm - 30.00 ppm) Expiration Date: 07/18/14

Mid-Level Calibration Gas Concentration: 54.55  
(50-60% of Span) Cylinder No.: CC114328  
( 50.00 ppm - 60.00 ppm) Expiration Date: 07/18/15

Test Date: 09/20/13

Tester: AT

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	11:46:40	25.40	0.05	-0.2	11:49:23	54.60	0.05	0.1
Run 2	12:00:39	25.60	0.15	0.6	12:03:23	54.60	0.05	0.1
Run 3	12:11:31	25.60	0.15	0.6	12:14:11	54.60	0.05	0.1
Avg. Monitor Response		25.53				54.60		
Reference/Target		25.45				54.55		
Absolute Difference			0.08				0.05	
% Calibration Error				0.3				0.1
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT CO Low Audit Test Results Analyzer Span: 100.00 ppm

Low-Level Calibration Gas Concentration: 25.34  
(20-30% of Span) Cylinder No.: cc200407  
( 20.00 ppm - 30.00 ppm) Expiration Date: 05/09/15

Mid-Level Calibration Gas Concentration: 54.50  
(50-60% of Span) Cylinder No.: cc58808  
( 50.00 ppm - 60.00 ppm) Expiration Date: 05/09/15

Test Date: 09/20/13

Tester: AT

*Allen T. H. H.*

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	11:41:12	26.40	1.06	4.2	11:43:56	53.00	1.50	-2.8
Run 2	11:55:15	24.90	0.44	-1.7	11:57:55	52.40	2.10	-3.9
Run 3	12:06:03	26.20	0.86	3.4	12:08:47	52.70	1.80	-3.3
Avg. Monitor Response		25.83	.			52.70		
Reference/Target		25.34				54.50		
Absolute Difference			0.49				1.80	
% Calibration Error				1.9				-3.3
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

*[Signature]*

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT CO High Audit Test Results Analyzer Span: 5000.0 ppm

Low-Level Calibration Gas Concentration: 1269.0  
(20-30% of Span) Cylinder No.: cc140211  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 07/18/14

Mid-Level Calibration Gas Concentration: 2819.0  
(50-60% of Span) Cylinder No.: cc114328  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 07/18/15

Test Date: 09/20/13

Tester: AT

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	11:46:40	1284.4	15.4	1.2	11:49:23	2820.3	1.3	0.0
Run 2	12:00:39	1280.3	11.3	0.9	12:03:23	2820.3	1.3	0.0
Run 3	12:11:31	1284.1	15.1	1.2	12:14:11	2819.4	0.4	0.0
Avg. Monitor Response		1282.9				2820.0		
Reference/Target		1269.0				2819.0		
Absolute Difference			13.9				1.0	
% Calibration Error				1.1				0.0
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor

# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

SF H2S Audit Test Results Analyzer Span: 300.0 ppm

Mfr & Model:

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 60.0 ppm - 90.0 ppm)

Concentration: 75.7  
Cylinder No.: CC411623  
Expiration Date: 09/04/16

Mid-Level Calibration Gas  
(50-60% of Span)  
( 150.0 ppm - 180.0 ppm)

Concentration: 161.6  
Cylinder No.: CC419518  
Expiration Date: 02/19/16

Test Date: 09/25/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	07:48:06	81.0	08:00:05	159.4
Run 2	08:12:05	79.2	08:24:07	159.4
Run 3	08:36:07	80.7	08:48:07	158.2
Avg. Monitor Response		80.3		159.0
Calibration Error	*	6.100		-1.600
Absolute Difference		4.6		2.6
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

SF TS Low Audit Test Results Analyzer Span: 5000.0 ppm

Mfr & Model:

Serial Number:

Low-Level Calibration Gas Concentration: 1257.000  
(20-30% of Span) Cylinder No.: CC416821  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 10/09/15

Mid-Level Calibration Gas Concentration: 2767.000  
(50-60% of Span) Cylinder No.: CC416805  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 10/08/15

Test Date: 09/25/13

Tester: AT



	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	07:44:09	1251.000	07:49:57	2827.000
Run 2	08:01:29	1289.000	08:07:21	2829.000
Run 3	08:25:47	1286.000	08:31:39	2827.000
Avg. Monitor Response		1275.300		2827.700
Calibration Error	*	1.500		2.200
Absolute Difference		18.300		60.700
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor



# CGA Test Report - 2013Q3

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

SF TS High Audit Test Results Analyzer Span: 500000 ppm

Mfr & Model:

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 100000 ppm - 150000

Concentration: 125000.00  
Cylinder No.: 4149354Y  
Expiration Date: 10/11/13

Mid-Level Calibration Gas  
(50-60% of Span)  
( 250000 ppm - 300000

Concentration: 274700.00  
Cylinder No.: 4064308Y  
Expiration Date: 10/12/13

Test Date: 09/25/13

Tester: AT

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	08:41:43	125531.00	08:47:35	277938.00
Run 2	08:58:30	127594.00	09:04:18	277688.00
Run 3	09:14:18	128844.00	09:20:09	277688.00
Avg. Monitor Response		127323.00		277771.00
Calibration Error	*	1.900		1.100
Absolute Difference		2323.00		3071.00
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor

Babcock & Wilcox Power Generation Group NetDAISE

Version 84.0

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_tgu

Period Start: 7/1/2013  
Period End: 9/9/2013  
Included Calibrations: CGA (40CFR60)

CGA Calibration Report  
Generated: 9/9/2013

Range of Analyzers:

Span of Analyzers:

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
09/06/2013	09:50	H2S_TGU	H2S_TGU	LOW	15.4	16.1	0.7	4.5	2.3	15.0	CG65975	9/24/2013
09/06/2013	09:50	H2S_TGU	H2S_TGU	MID	37.0	36.1	-0.9	-2.4	5.6	15.0	CC192452	10/10/2013
09/06/2013	09:18	H2S_TGU	H2S_TGU	LOW	15.4	16.5	1.1	7.1	2.3	15.0	CG65975	9/24/2013
09/06/2013	09:18	H2S_TGU	H2S_TGU	MID	37.0	35.8	-1.2	-3.2	5.6	15.0	CC192452	10/10/2013
09/06/2013	08:41	H2S_TGU	H2S_TGU	LOW	15.4	16.6	1.2	7.8	2.3	15.0	CG65975	9/24/2013
09/06/2013	08:41	H2S_TGU	H2S_TGU	MID	37.0	36.0	-1.0	-2.7	5.6	15.0	CC192452	10/10/2013
09/06/2013	09:50	TRS_TGU	TRS_TGU	LOW	119.9	109.4	-10.5	-8.8	18.0	15.0	CG65975	9/24/2013
09/06/2013	09:50	TRS_TGU	TRS_TGU	MID	245.0	242.7	-2.3	-0.9	36.8	15.0	CC192452	10/10/2013
09/06/2013	09:18	TRS_TGU	TRS_TGU	LOW	119.9	109.2	-7.7	-6.4	18.0	15.0	CG65975	9/24/2013
09/06/2013	09:18	TRS_TGU	TRS_TGU	MID	245.0	241.1	-3.9	-1.6	36.8	15.0	CC192452	10/10/2013
09/06/2013	08:41	TRS_TGU	TRS_TGU	LOW	119.9	110.4	0.5	0.4	18.0	15.0	CG65975	9/24/2013
09/06/2013	08:41	TRS_TGU	TRS_TGU	MID	245.0	242.6	-2.4	-1.0	36.8	15.0	CC192452	10/10/2013

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
@ = Bottle is within 7 days of expiration  
# = Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff	Target	Diff	Target
H2S_TGU	1.0	6.5%	1.0	2.8%
TRS_TGU	10.2	8.5%	2.9	1.2%

CGA Calibration Report  
Generated: 9/9/2013

Period Start: 7/1/2013  
Period End: 9/9/2013  
Included Calibrations: CGA (40CFR60)

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_tgu

Performance Specification			FAIL
Channel	PASS		
H2S_TGU	H2S	<=15.0%	>15.0%
TRS_TGU	TRS	<=15.0%	>15.0%

Perf: [Part60 CGA H2S] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA H2S] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA TRS] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA TRS] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Analyzer Engineer Signature: [Signature] Date: 9, 9, 13  
Title: Analyzer Tech Signature: [Signature] Date: 9, 9, 13

CGA Calibration Report  
Generated: 9/10/2013Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_sbsPeriod Start: 9/10/2013  
Period End: 9/10/2013  
Included Calibrations: CGA (40CFR60)

## Range of Analyzers:

## Span of Analyzers:

Date	Time	From	Channel	Type	Target	Actual	Diff	Error	CGA Allowable	Bottle ID	Expire Date
09/10/2013	17:05	3 Pt.	O2 SBS	LOW	5.0	4.7	-0.3	-6.2	0.8	CC194574	3/7/2021
09/10/2013	17:05		O2 SBS	O2	10.0	9.6	-0.4	-3.7	1.5	SG9162957BAL	3/7/2021
09/10/2013	16:45		O2 SBS	LOW	5.0	4.7	-0.3	-6.2	0.8	CC194574	3/7/2021
09/10/2013	16:45		O2 SBS	O2	10.0	9.6	-0.4	-3.7	1.5	SG9162957BAL	3/7/2021
09/10/2013	16:27		O2 SBS	LOW	5.0	4.7	-0.3	-6.2	0.8	CC194574	3/7/2021
09/10/2013	16:27		O2 SBS	O2	10.0	9.6	-0.4	-3.7	1.5	SG9162957BAL	3/7/2021
09/10/2013	17:05		SO2RAW SBS	LOW	125.6	129.7	4.1	3.3	18.8	CC194574	3/7/2021
09/10/2013	17:05		SO2RAW SBS	O2	283.5	288.5	5.0	1.8	42.5	SG9162957BAL	3/7/2021
09/10/2013	16:45		SO2RAW SBS	LOW	125.6	129.7	4.1	3.3	18.8	CC194574	3/7/2021
09/10/2013	16:45		SO2RAW SBS	O2	283.5	289.6	6.1	2.2	42.5	SG9162957BAL	3/7/2021
09/10/2013	16:27		SO2RAW SBS	LOW	125.6	128.9	3.3	2.6	18.8	CC194574	3/7/2021
09/10/2013	16:27		SO2RAW SBS	O2	283.5	288.4	4.9	1.7	42.5	SG9162957BAL	3/7/2021

FAIL = Difference Error > Regulations Allow  
 TARG = Invalid Target (not within regulatory specs)  
 RDG = Reading exceeds "Range of Analyzer"  
 \* Bottle is within 7 days of expiration  
 \* Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

		---LOW---		---MID---	
Channel	Diff	Target	Diff	Target	
O2_SBS	Units	%	Units	%	
SO2RAW_SBS	0.3	6.2%	0.4	3.7%	
	3.8	3.1%	5.3	1.9%	



Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_sbs

CGA Calibration Report  
Generated: 9/10/2013

Period Start: 9/10/2013  
Period End: 9/10/2013  
Included Calibrations: CGA (40CER60)

Performance Specification			
Channel		PASS	FAIL
O2_SBS	O2	<=15.0%	>15.0%
SO2RAW_SBS	SO2	<=15.0%	>15.0%

Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
Perf: [Part60 CGA SO2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA SO2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Analyzer Supervisor Signature:  Date: 9/10/13  
Title: Annual Supervisor Signature:  Date: / /

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

BP Products North America, Inc.  
Generated: 9/3/2013

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_sru\_1

Period Start: 9/3/2013  
Period End: 9/3/2013  
Included Calibrations: (BP (P60) :CGA)

Range of Analyzers:

Span of Analyzers:

O2 SRU INC	O2	20.00 %	O2 SRU INC	O2	20.00 %
SO2RAW IN	SO2	5.000 %	SO2RAW IN	SO2	5.000 %

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	Part 60	Bottle ID	Expire Date
09/03/2013	13:20		O2 SRU INC	LOW	5.0	5.0	0.1	1.0	PASS	CC140252	8/25/2014
09/03/2013	13:20		O2 SRU INC	MID	10.9	11.0	0.1	0.9	PASS	LCC0SA6896	5/31/2015
09/03/2013	13:06		O2 SRU INC	LOW	5.0	5.0	0.1	1.0	PASS	CC140252	8/25/2014
09/03/2013	13:06		O2 SRU INC	MID	10.9	11.1	0.1	1.0	PASS	LCC0SA6896	5/31/2015
09/03/2013	12:53		O2 SRU INC	LOW	5.0	5.0	0.1	1.0	PASS	CC140252	8/25/2014
09/03/2013	12:53		O2 SRU INC	MID	10.9	11.1	0.1	1.0	PASS	LCC0SA6896	5/31/2015
09/03/2013	13:20		SO2RAW IN	LOW	1.3	1.3	0.0	1.8	PASS	CC140252	8/25/2014
09/03/2013	13:20		SO2RAW IN	MID	2.7	2.8	0.1	4.4	PASS	LCC0SA6896	5/31/2015
09/03/2013	13:06		SO2RAW IN	LOW	1.3	1.3	0.0	1.4	PASS	CC140252	8/25/2014
09/03/2013	13:06		SO2RAW IN	MID	2.7	2.8	0.1	4.3	PASS	LCC0SA6896	5/31/2015
09/03/2013	12:53		SO2RAW IN	LOW	1.3	1.3	0.0	0.4	PASS	CC140252	8/25/2014
09/03/2013	12:53		SO2RAW IN	MID	2.7	2.8	0.1	4.0	PASS	LCC0SA6896	5/31/2015

**FAIL** - Difference Error > Regulations Allow

# Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Calibration (Absolute Average DIFF and Calibration % Error)

		----LOW----		----MID----	
Channel	Diff	Target	Diff	Target	
O2 SRU INC	Units	%	Units	%	
SO2RAW IN	0.1	1.0%	0.1	1.0%	
	0.0	1.2%	0.1	4.2%	

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_sru\_1

BP Products North America, Inc.  
Generated: 9/3/2013

Period Start: 9/3/2013  
Period End: 9/3/2013  
Included Calibrations: (BP(P60):CGA)

Performance Specification

Channel	LOW		MID	
	PASS	FAIL	PASS	FAIL
O2 SRU INC	<=15.0%	>15.0%	<=15.0%	>15.0%
SO2RAW IN	<=15.0%	>15.0%	<=15.0%	>15.0%

[BP(P60):CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
[BP(P60):CGA SO2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: Analyzer Supervisor Signature:: *Colin G. Gies* Date: 9/3/13

Title:: Analyzer Supervisor Signature:: *Bill H. H.* Date: 9/3/13

Linearity Calibration Report  
Generated: 7/23/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/22/2013  
Period End: 7/22/2013  
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

Span of Analyzers:

02_31	02	25.00 %O2	02_31	02	0.00	25.00 %O2
NOxLow_31	NOx	50.00 ppm	NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	700.0 ppm	NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%	Bottle ID	Expire Date
07/22/2013	11:53	NOxHigh_31	NOx	181.400	179.800	-1.600	-0.9	9.070	5.0	CC364233	1/13/2014
07/22/2013	11:53	NOxHigh_31	NOx	391.200	410.800	19.600	5.0	19.560	5.0	CC331503	5/15/2014
07/22/2013	11:53	NOxHigh_31	NOx	640.500	659.500	19.000	3.0	32.025	5.0	SG9130614BAL	6/11/2014
07/22/2013	11:15	NOxHigh_31	NOx	181.400	187.900	6.500	3.6	9.070	5.0	CC364233	1/13/2014
07/22/2013	11:15	NOxHigh_31	NOx	391.200	409.800	18.600	4.8	19.560	5.0	CC331503	5/15/2014
07/22/2013	11:15	NOxHigh_31	NOx	640.500	658.100	17.600	2.7	32.025	5.0	SG9130614BAL	6/11/2014
07/22/2013	10:37	NOxHigh_31	NOx	181.400	173.000	-8.400	-4.6	9.070	5.0	CC364233	1/13/2014
07/22/2013	10:37	NOxHigh_31	NOx	391.200	409.100	17.900	4.6	19.560	5.0	CC331503	5/15/2014
07/22/2013	10:37	NOxHigh_31	NOx	640.500	656.900	16.400	2.6	32.025	5.0	SG9130614BAL	6/11/2014
07/22/2013	11:53	NOxLow_31	NOx	12.990	12.830	-0.160	-1.5	0.650	5.0	CC208311	5/15/2014
07/22/2013	11:53	NOxLow_31	NOx	27.590	27.590	0.000	0.0	1.380	5.0	CC364299	1/19/2014
07/22/2013	11:53	NOxLow_31	NOx	45.550	45.700	0.150	0.4	2.277	5.0	CC310186	2/19/2016
07/22/2013	11:15	NOxLow_31	NOx	12.990	12.830	-0.160	-1.5	0.650	5.0	CC208311	5/15/2014
07/22/2013	11:15	NOxLow_31	NOx	27.590	27.590	0.000	0.0	1.380	5.0	CC364299	1/19/2014
07/22/2013	10:37	NOxLow_31	NOx	12.990	12.770	-0.220	-1.5	0.650	5.0	CC310186	2/19/2016
07/22/2013	10:37	NOxLow_31	NOx	27.590	27.590	-0.090	-0.4	1.380	5.0	CC208311	5/15/2014
07/22/2013	10:37	NOxLow_31	NOx	45.550	45.510	-0.040	0.0	2.277	5.0	CC364299	1/19/2014
07/22/2013	11:53	O2_31	O2	6.260	6.200	-0.060	-1.6	0.313	5.0	CC310186	2/19/2016
07/22/2013	11:53	O2_31	O2	13.760	13.660	-0.100	-0.7	0.688	5.0	CC2384	11/3/2014
07/22/2013	11:53	O2_31	O2	21.080	20.910	-0.170	-0.9	1.054	5.0	CC332261	10/6/2013
07/22/2013	11:15	O2_31	O2	6.260	6.200	-0.060	-1.6	0.313	5.0	CC54920	2/18/2021
07/22/2013	11:15	O2_31	O2	13.760	13.680	-0.080	-0.7	0.688	5.0	CC2384	11/3/2014
07/22/2013	11:15	O2_31	O2	21.080	20.920	-0.160	-0.9	1.054	5.0	CC332261	10/6/2013
07/22/2013	10:37	O2_31	O2	6.260	6.210	-0.050	-1.6	0.313	5.0	CC54920	2/18/2021
07/22/2013	10:37	O2_31	O2	13.760	13.680	-0.080	-0.7	0.688	5.0	CC2384	11/3/2014
07/22/2013	10:37	O2_31	O2	21.080	20.940	-0.140	-0.5	1.054	5.0	CC332261	10/6/2013
07/22/2013	10:37	O2_31	O2							CC54920	2/18/2021

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Linearity Calibration Report  
Generated: 7/23/2013

Company: BP Products North America, Inc.  
 Plant: 2815 Indianapolis Blvd.  
 City/St: Whiting, IN 46394  
 Source: stack

Period Start: 7/22/2013  
 Period End: 7/22/2013  
 Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute (Target - Average Reading)/(Target) \* 100

Channel	----LOW----		---MID---		---HIGH---	
	Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
NOxHigh_31	1.167	0.6%	18.700	4.8%	17.667	2.8%
NOxLow_31	0.180	1.4%	0.033	0.1%	0.057	0.1%
O2_31	0.057	0.9%	0.087	0.6%	0.157	0.7%

## Performance Specification

Channel	Performance Specification	
	PASS	FAIL
NOxHigh_31	NOx	<=5.0%
NOxLow_31	NOx	<=5.0%
O2_31	O2	<=5.0%

**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: \_\_\_\_\_ Signature: *Bill Hays* Date: 7/22/13  
 Title: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: 7/22/13

**Babcock & Wilcox Power Generation Group NetDA99**

Version 84.0

CGA Calibration Report  
Generated: 7/23/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/22/2013  
Period End: 7/22/2013  
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

Span of Analyzers:

O2_31	0.00	25.00 %O2	O2_31	0.00	25.00 %O2
CO_Low_31	0.00	100.00 ppm	CO_Low_31	0.00	100.00 ppm
CO_High_31	0	5000 ppm	CO_High_31	0	5000 ppm
NOx_Low_31	0.00	50.00 ppm	NOx_Low_31	0.00	50.00 ppm
NOx_High_31	0.0	700.0 ppm	NOx_High_31	0.0	700.0 ppm

Date	Time	3 Pt.	From	Channel	Type	Target	Actual	Diff	Error	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/22/2013	11:53	*	*	CO_High_31	CO	1238.00	1190.00	-48.00	-3.9	185.70	15.0	CC208311	5/15/2014
07/22/2013	11:53	*	*	CO_Low_31	CO	2806.00	2706.00	-100.00	-3.6	420.90	15.0	CC364299	1/19/2014
07/22/2013	11:15	*	*	CO_High_31	CO	1238.00	1192.00	-46.00	-3.7	185.70	15.0	CC208311	5/15/2014
07/22/2013	11:15	*	*	CO_High_31	CO	2806.00	2712.00	-94.00	-3.3	420.90	15.0	CC364299	1/19/2014
07/22/2013	10:37	*	*	CO_High_31	CO	1238.00	1194.00	-44.00	-3.6	185.70	15.0	CC208311	5/15/2014
07/22/2013	10:37	*	*	CO_High_31	CO	2806.00	2716.00	-90.00	-3.2	420.90	15.0	CC364299	1/19/2014
07/22/2013	11:53	*	*	CO_Low_31	CO	25.18	25.22	0.04	0.2	3.78	15.0	CC2384	11/3/2014
07/22/2013	11:53	*	*	CO_Low_31	CO	55.64	55.09	-0.55	-1.0	8.35	15.0	CC332261	10/6/2013
07/22/2013	11:15	*	*	CO_Low_31	CO	25.18	25.50	0.32	1.3	3.78	15.0	CC2384	11/3/2014
07/22/2013	11:15	*	*	CO_Low_31	CO	55.64	55.33	-0.31	-0.6	8.35	15.0	CC332261	10/6/2013
07/22/2013	10:37	*	*	CO_Low_31	CO	25.18	25.70	0.52	2.1	3.78	15.0	CC2384	11/3/2014
07/22/2013	10:37	*	*	CO_Low_31	CO	55.64	55.62	-0.02	0.0	8.35	15.0	CC332261	10/6/2013
07/22/2013	11:53	*	*	NOx_High_31	NOx	181.40	179.80	-1.60	-0.9	27.21	15.0	CC364233	1/13/2014
07/22/2013	11:53	*	*	NOx_High_31	NOx	391.20	410.80	19.60	5.0	58.68	15.0	CC331503	5/15/2014
07/22/2013	11:15	*	*	NOx_High_31	NOx	181.40	187.90	6.50	3.6	27.21	15.0	CC364233	1/13/2014
07/22/2013	11:15	*	*	NOx_High_31	NOx	391.20	409.80	18.60	4.8	58.68	15.0	CC331503	5/15/2014
07/22/2013	10:37	*	*	NOx_High_31	NOx	181.40	173.00	-8.40	-4.6	27.21	15.0	CC364233	1/13/2014
07/22/2013	10:37	*	*	NOx_High_31	NOx	391.20	409.10	17.90	4.6	58.68	15.0	CC331503	5/15/2014
07/22/2013	11:53	*	*	NOx_Low_31	NOx	12.99	12.83	-0.16	-1.2	1.95	15.0	CC208311	5/15/2014
07/22/2013	11:53	*	*	NOx_Low_31	NOx	27.59	27.58	-0.01	0.0	4.14	15.0	CC364299	1/19/2014
07/22/2013	11:15	*	*	NOx_Low_31	NOx	12.99	12.83	-0.16	-1.2	1.95	15.0	CC208311	5/15/2014
07/22/2013	11:15	*	*	NOx_Low_31	NOx	27.59	27.59	0.00	0.0	4.14	15.0	CC364299	1/19/2014
07/22/2013	10:37	*	*	NOx_Low_31	NOx	12.99	12.77	-0.22	-1.7	1.95	15.0	CC208311	5/15/2014
07/22/2013	10:37	*	*	NOx_Low_31	NOx	27.59	27.50	-0.09	-0.3	4.14	15.0	CC364299	1/19/2014
07/22/2013	11:53	*	*	O2_31	O2	6.26	6.20	-0.06	-1.0	0.94	15.0	CC2384	11/3/2014
07/22/2013	11:53	*	*	O2_31	O2	13.76	13.66	-0.10	-0.7	2.06	15.0	CC332261	10/6/2013

CGA Calibration Report  
Generated: 7/23/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: Stack

Period Start: 7/22/2013  
Period End: 7/22/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	Bottle ID	Expire Date
07/22/2013	11:15	*	O2_31	O2	6.26	6.20	-0.06	-1.0	0.94	15.0	PASS
07/22/2013	11:15	*	O2_31	O2	13.76	13.68	-0.08	-0.6	2.06	15.0	PASS
07/22/2013	10:37	*	O2_31	O2	6.26	6.21	-0.05	-0.8	0.94	15.0	PASS
07/22/2013	10:37	*	O2_31	O2	13.76	13.68	-0.08	-0.6	2.06	15.0	PASS

**FAIL** = Difference Error > Regulations Allow  
**TARG** = Invalid Target (not within regulatory specs)  
**RDG** = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

		---LOW---		---MID---	
Channel	Units	Diff	Target	Diff	Target
COHigh_31	CO	46.00	3.7%	94.67	3.4%
COLow_31	CO	0.29	1.2%	0.29	0.5%
NOxHigh_31	NOx	1.17	0.6%	18.70	4.8%
NOxLow_31	NOx	0.18	1.4%	0.03	0.1%
O2_31	O2	0.06	0.9%	0.09	0.6%

## Performance Specification

Channel	PASS	FAIL
COHigh_31	<=15.0%	>15.0%
COLow_31	<=15.0%	>15.0%
NOxHigh_31	<=15.0%	>15.0%
NOxLow_31	<=15.0%	>15.0%
O2_31	<=15.0%	>15.0%

**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title: Signature: *Chadley* Date: 7/23/13

Title: Signature: *Bill Hays* Date: 7/23/13

Linearity Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

Span of Analyzers:

O2_32	0.00	25.00 %O2	O2	0.00	25.00 %O2
CO_Low_32	0.00	100.00 ppm	CO	0.00	100.00 ppm
CO_High_32	0	5000 ppm	CO	0	5000 ppm
NOx_Low_32	0.00	50.00 ppm	NOx	0.00	50.00 ppm
NOx_High_32	0.0	700.0 ppm	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable Units	%	Bottle ID	Expire Date
07/11/2013	09:23	CO_High_32	CO	1238.000	1198.900	-40.000	-N/A	-N/A	-N/A	*CC208311	5/15/2014
07/11/2013	09:23	CO_High_32	CO	2806.000	2736.000	-70.000	-N/A	-N/A	-N/A	*CC364299	1/19/2014
07/11/2013	09:23	CO_High_32	CO	4455.000	4537.000	82.000	-N/A	-N/A	-N/A	*CC310186	2/19/2016
07/11/2013	08:43	CO_High_32	CO	1238.000	1197.000	-41.000	-N/A	-N/A	-N/A	*CC208311	5/15/2014
07/11/2013	08:43	CO_High_32	CO	2806.000	2738.000	-68.000	-N/A	-N/A	-N/A	*CC364299	1/19/2014
07/11/2013	08:43	CO_High_32	CO	4455.000	4535.000	80.000	-N/A	-N/A	-N/A	*CC310186	2/19/2016
07/11/2013	08:03	CO_High_32	CO	1238.000	1196.000	-42.000	-N/A	-N/A	-N/A	*CC208311	5/15/2014
07/11/2013	08:03	CO_High_32	CO	2806.000	2733.000	-73.000	-N/A	-N/A	-N/A	*CC364299	1/19/2014
07/11/2013	08:03	CO_High_32	CO	4455.000	4532.000	77.000	-N/A	-N/A	-N/A	*CC310186	2/19/2016
07/11/2013	09:23	CO_Low_32	CO	25.180	25.290	0.110	-N/A	-N/A	-N/A	*CC2384	11/3/2014
07/11/2013	09:23	CO_Low_32	CO	55.640	55.510	-0.130	-N/A	-N/A	-N/A	*CC332261	10/6/2013
07/11/2013	09:23	CO_Low_32	CO	90.610	90.480	-0.130	-N/A	-N/A	-N/A	*CC54920	2/18/2021
07/11/2013	09:23	CO_Low_32	CO	25.180	25.310	0.130	-N/A	-N/A	-N/A	*CC2384	11/3/2014
07/11/2013	08:43	CO_Low_32	CO	55.640	55.510	-0.130	-N/A	-N/A	-N/A	*CC332261	10/6/2013
07/11/2013	08:43	CO_Low_32	CO	90.610	90.480	-0.130	-N/A	-N/A	-N/A	*CC54920	2/18/2021
07/11/2013	08:03	CO_Low_32	CO	25.180	25.280	0.100	-N/A	-N/A	-N/A	*CC2384	11/3/2014
07/11/2013	08:03	CO_Low_32	CO	55.640	55.430	-0.210	-N/A	-N/A	-N/A	*CC332261	10/6/2013
07/11/2013	08:03	CO_Low_32	CO	90.610	90.380	-0.230	-N/A	-N/A	-N/A	*CC54920	2/18/2021
07/11/2013	09:23	NOx_High_32	NOx	181.400	189.800	8.400	4.6	9.070	5.0	*CC364233	1/13/2014
07/11/2013	09:23	NOx_High_32	NOx	391.200	406.400	15.200	3.9	19.560	5.0	*CC331503	5/15/2014
07/11/2013	09:23	NOx_High_32	NOx	652.700	657.800	5.100	0.8	32.635	5.0	SG9130614BAL	6/11/2014
07/11/2013	08:43	NOx_High_32	NOx	181.400	190.100	8.700	4.8	9.070	5.0	*CC364233	1/13/2014
07/11/2013	08:43	NOx_High_32	NOx	391.200	406.900	15.700	4.0	19.560	5.0	*CC331503	5/15/2014
07/11/2013	08:43	NOx_High_32	NOx	652.700	659.000	6.300	1.0	32.635	5.0	*SG9130614BAL	6/11/2014
07/11/2013	08:03	NOx_High_32	NOx	181.400	189.700	8.300	4.6	9.070	5.0	*CC364233	1/13/2014
07/11/2013	08:03	NOx_High_32	NOx	391.200	406.300	15.100	3.9	19.560	5.0	*CC331503	5/15/2014
07/11/2013	08:03	NOx_High_32	NOx	652.700	657.800	5.100	0.8	32.635	5.0	*SG9130614BAL	6/11/2014

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

Linearity Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable Units	%	Bottle ID	Expire Date
07/11/2013	09:23	NOxLow_32	NOx	12.990	12.200	-0.790	-6.2	0.000	5.0	CC208311	5/15/2014
07/11/2013	09:23	NOxLow_32	NOx	27.590	26.800	-0.790	-2.9	1.380	5.0	CC364299	1/19/2014
07/11/2013	09:23	NOxLow_32	NOx	44.890	44.470	-0.420	-0.9	2.244	5.0	CC310186	2/19/2016
07/11/2013	08:43	NOxLow_32	NOx	12.990	12.160	-0.830	-6.2	0.000	5.0	CC208311	5/15/2014
07/11/2013	08:43	NOxLow_32	NOx	27.590	26.770	-0.820	-2.9	1.380	5.0	CC364299	1/19/2014
07/11/2013	08:43	NOxLow_32	NOx	44.890	44.530	-0.360	-0.9	2.244	5.0	CC310186	2/19/2016
07/11/2013	08:03	NOxLow_32	NOx	12.990	12.180	-0.810	-6.2	0.000	5.0	CC208311	5/15/2014
07/11/2013	08:03	NOxLow_32	NOx	27.590	26.770	-0.820	-2.9	1.380	5.0	CC364299	1/19/2014
07/11/2013	08:03	NOxLow_32	NOx	44.890	44.530	-0.360	-0.9	2.244	5.0	CC310186	2/19/2016
07/11/2013	09:23	O2_32	O2	6.260	6.410	0.150	1.6	0.313	5.0	CC2384	11/3/2014
07/11/2013	09:23	O2_32	O2	13.760	13.900	0.140	0.7	0.688	5.0	CC332261	10/6/2013
07/11/2013	09:23	O2_32	O2	20.990	21.180	0.190	1.0	1.049	5.0	CC54920	2/18/2021
07/11/2013	08:43	O2_32	O2	6.260	6.410	0.150	1.6	0.313	5.0	CC2384	11/3/2014
07/11/2013	08:43	O2_32	O2	13.760	13.900	0.140	0.7	0.688	5.0	CC332261	10/6/2013
07/11/2013	08:43	O2_32	O2	20.990	21.180	0.190	1.0	1.049	5.0	CC54920	2/18/2021
07/11/2013	08:03	O2_32	O2	6.260	6.400	0.140	1.6	0.313	5.0	CC2384	11/3/2014
07/11/2013	08:03	O2_32	O2	13.760	13.880	0.120	0.7	0.688	5.0	CC332261	10/6/2013
07/11/2013	08:03	O2_32	O2	20.990	21.160	0.170	1.0	1.049	5.0	CC54920	2/18/2021

**FAIL** = Difference Error > Regulations Allow

**TARG** = Invalid Target (not within regulatory specs)

**RDC** = Reading exceeds "Range of Analyzer"

**Note:** 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Linearity Calibration Report  
Generated: 7/11/2013

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Absolute Average Diff and Absolute(Target - Average Reading)/Target) \* 100

Channel	---LOW---		---MID---		---HIGH---	
	Diff	Target	Diff	Target	Diff	Target
COHigh_32	41.000	- N/A -	70.333	- N/A -	79.667	- N/A -
COLow_32	0.113	- N/A -	0.157	- N/A -	0.163	- N/A -
NOxHigh_32	8.467	4.7%	15.333	3.9%	5.500	0.8%
NOxLow_32	0.810	6.2%	0.810	2.9%	0.380	0.8%
O2_32	0.147	2.3%	0.133	1.0%	0.183	0.9%

Performance Specification

Channel	PASS		FAIL	
	Diff	Target	Diff	Target
COHigh_32	- N/A -	- N/A -	- N/A -	- N/A -
COLow_32	- N/A -	- N/A -	- N/A -	- N/A -
NOxHigh_32	<=5.0%	>5.0%	<=5.0%	>5.0%
NOxLow_32	<=5.0%	>5.0%	<=5.0%	>5.0%
O2_32	<=5.0%	>5.0%	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Signature: Joseph Winters Date: 7/11/13

Title: Signature: Bill Hughes Date: 7/11/13

**Babcock & Wilcox Power Generation Group NetDAISE**

Version 84.0

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

CGA Calibration Report  
Generated: 7/11/2013

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_32	O2	0.00
COHigh_32	CO	0.00
COLow_32	CO	0
NOxLow_32	NOx	0.00
NOxHigh_32	NOx	0.0

Span of Analyzers:

O2_32	O2	0.00	25.00 %O2
COHigh_32	CO	0.00	100.00 ppm
COLow_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	From	3 Pt.	Channel	Type	Target	Actual	Diff	Error	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/11/2013	09:23	*	*	COHigh_32	CO	1238.0	1198.0	-40.0	-3.2	185.7	15.0	CG208311	5/15/2014
07/11/2013	09:23	*	*	COHigh_32	CO	2806.0	2736.0	-70.0	-2.5	420.9	15.0	CG364299	1/19/2014
07/11/2013	08:43	*	*	COHigh_32	CO	1238.0	1197.0	-41.0	-3.3	185.7	15.0	CG208311	5/15/2014
07/11/2013	08:43	*	*	COHigh_32	CO	2806.0	2738.0	-68.0	-2.4	420.9	15.0	CG364299	1/19/2014
07/11/2013	08:03	*	*	COHigh_32	CO	1238.0	1196.0	-42.0	-3.4	185.7	15.0	CG208311	5/15/2014
07/11/2013	08:03	*	*	COHigh_32	CO	2806.0	2733.0	-73.0	-2.6	420.9	15.0	CG364299	1/19/2014
07/11/2013	09:23	*	*	COLow_32	CO	25.2	25.3	0.1	0.4	3.8	15.0	CG2384	11/3/2014
07/11/2013	09:23	*	*	COLow_32	CO	55.6	55.5	-0.1	-0.2	8.3	15.0	CG332261	10/6/2013
07/11/2013	08:43	*	*	COLow_32	CO	25.2	25.3	0.1	0.5	3.8	15.0	CG2384	11/3/2014
07/11/2013	08:43	*	*	COLow_32	CO	55.6	55.5	-0.1	-0.2	8.3	15.0	CG332261	10/6/2013
07/11/2013	08:03	*	*	COLow_32	CO	25.2	25.3	0.1	0.4	3.8	15.0	CG2384	11/3/2014
07/11/2013	08:03	*	*	COLow_32	CO	55.6	55.4	-0.2	-0.4	8.3	15.0	CG332261	10/6/2013
07/11/2013	09:23	*	*	NOxHigh_32	NOx	181.4	189.8	8.4	4.6	27.2	15.0	CG364233	1/13/2014
07/11/2013	09:23	*	*	NOxHigh_32	NOx	391.2	406.4	15.2	3.9	58.7	15.0	CG331503	5/15/2014
07/11/2013	08:43	*	*	NOxHigh_32	NOx	181.4	190.1	8.7	4.8	27.2	15.0	CG364233	1/13/2014
07/11/2013	08:43	*	*	NOxHigh_32	NOx	391.2	406.9	15.7	4.0	58.7	15.0	CG331503	5/15/2014
07/11/2013	08:03	*	*	NOxHigh_32	NOx	181.4	189.7	8.3	4.6	27.2	15.0	CG364233	1/13/2014
07/11/2013	08:03	*	*	NOxHigh_32	NOx	391.2	406.3	15.1	3.9	58.7	15.0	CG331503	5/15/2014
07/11/2013	09:23	*	*	NOxLow_32	NOx	13.0	12.2	-0.8	-6.1	1.9	15.0	CG208311	5/15/2014
07/11/2013	09:23	*	*	NOxLow_32	NOx	27.6	26.8	-0.8	-2.9	4.1	15.0	CG364299	1/19/2014
07/11/2013	08:43	*	*	NOxLow_32	NOx	13.0	12.2	-0.8	-6.4	1.9	15.0	CG208311	5/15/2014
07/11/2013	08:43	*	*	NOxLow_32	NOx	27.6	26.8	-0.8	-3.0	4.1	15.0	CG364299	1/19/2014
07/11/2013	08:03	*	*	NOxLow_32	NOx	13.0	12.2	-0.8	-6.2	1.9	15.0	CG208311	5/15/2014
07/11/2013	08:03	*	*	NOxLow_32	NOx	27.6	26.8	-0.8	-3.0	4.1	15.0	CG364299	1/19/2014
07/11/2013	09:23	*	*	O2_32	O2	6.3	6.4	0.1	2.4	0.9	15.0	CG2384	11/3/2014
07/11/2013	09:23	*	*	O2_32	O2	13.8	13.9	0.1	1.0	2.1	15.0	CG332261	10/6/2013

CGA Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/11/2013	08:43	3 Pt.	02_32	LOW	6.3	6.4	0.1	2.4	0.9	15.0	*CC2384	11/3/2014
07/11/2013	08:43		02_32	MID	13.8	13.9	0.1	1.0	2.1	15.0	*CC332261	10/6/2013
07/11/2013	08:03		02_32	LOW	6.3	6.4	0.1	2.2	0.9	15.0	*CC2384	11/3/2014
07/11/2013	08:03		02_32	MID	13.8	13.9	0.1	0.9	2.1	15.0	*CC332261	10/6/2013

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/(Target) \* 100

Channel	Diff	Target	Diff	Target
COHigh_32	41.0	3.3%	70.3	2.5%
COLow_32	0.1	0.5%	0.2	0.3%
NOxHigh_32	8.5	4.7%	15.3	3.9%
NOxLow_32	0.8	6.2%	0.8	2.9%
O2_32	0.1	2.3%	0.1	1.0%

Performance Specification

Channel	FAIL
COHigh_32	<=15.0%
COLow_32	<=15.0%
NOxHigh_32	<=15.0%
NOxLow_32	<=15.0%
O2_32	<=15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Signature: Joseph W. [Signature] Date: 7/11/13

Title: Signature: Bill High Date: 7/11/13

Linearity Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

Span of Analyzers:

Date	Time	Channel	Type	Target		Actual		Diff	Units		Error %	Units		Linearity Allowable (40CFR75)	Bottle ID	Expire Date
				Units	Value	Units	Value		Units	Value		Units	Value			
07/11/2013	10:35	COHigh_33	CO	1236.000	1275.000	39.000	39.000	-	N/A	-	N/A	-	N/A	-	CC174083	11/3/2013
07/11/2013	10:35	COHigh_33	CO	2810.000	2779.000	-31.000	-31.000	-	N/A	-	N/A	-	N/A	-	CC332257	1/19/2014
07/11/2013	10:35	COHigh_33	CO	4536.000	4502.000	-34.000	-34.000	-	N/A	-	N/A	-	N/A	-	CC241669	2/19/2016
07/11/2013	09:51	COHigh_33	CO	1236.000	1275.000	39.000	39.000	-	N/A	-	N/A	-	N/A	-	CC174083	11/3/2013
07/11/2013	09:51	COHigh_33	CO	2810.000	2780.000	-30.000	-30.000	-	N/A	-	N/A	-	N/A	-	CC332257	1/19/2014
07/11/2013	09:51	COHigh_33	CO	4536.000	4502.000	-34.000	-34.000	-	N/A	-	N/A	-	N/A	-	CC241669	2/19/2016
07/11/2013	09:09	COHigh_33	CO	1236.000	1275.000	39.000	39.000	-	N/A	-	N/A	-	N/A	-	CC174083	11/3/2013
07/11/2013	09:09	COHigh_33	CO	2810.000	2778.000	-32.000	-32.000	-	N/A	-	N/A	-	N/A	-	CC332257	1/19/2014
07/11/2013	09:09	COHigh_33	CO	4536.000	4500.000	-36.000	-36.000	-	N/A	-	N/A	-	N/A	-	CC241669	2/19/2016
07/11/2013	10:35	COLow_33	CO	24.900	25.400	0.500	0.500	-	N/A	-	N/A	-	N/A	-	CC134940	1/23/2015
07/11/2013	10:35	COLow_33	CO	54.430	54.430	-0.010	-0.010	-	N/A	-	N/A	-	N/A	-	CC349278	5/14/2015
07/11/2013	10:35	COLow_33	CO	90.690	89.860	-0.830	-0.830	-	N/A	-	N/A	-	N/A	-	CC222250	2/18/2021
07/11/2013	09:51	COLow_33	CO	24.900	25.400	0.500	0.500	-	N/A	-	N/A	-	N/A	-	CC134940	1/23/2015
07/11/2013	09:51	COLow_33	CO	54.430	54.470	0.040	0.040	-	N/A	-	N/A	-	N/A	-	CC349278	5/14/2015
07/11/2013	09:51	COLow_33	CO	90.690	89.820	-0.870	-0.870	-	N/A	-	N/A	-	N/A	-	CC134940	1/23/2015
07/11/2013	09:09	COLow_33	CO	24.900	25.500	0.600	0.600	-	N/A	-	N/A	-	N/A	-	CC349278	5/14/2015
07/11/2013	09:09	COLow_33	CO	54.430	54.430	0.000	0.000	-	N/A	-	N/A	-	N/A	-	CC222250	2/18/2021
07/11/2013	09:09	COLow_33	CO	90.690	89.860	-0.830	-0.830	-	N/A	-	N/A	-	N/A	-	CC349278	5/14/2015
07/11/2013	10:35	NoxHigh_33	Nox	179.700	180.400	0.700	0.700	-	N/A	-	N/A	-	N/A	-	SG9148157BAL	5/2/2014
07/11/2013	10:35	NoxHigh_33	Nox	395.300	395.000	-0.300	-0.300	-	N/A	-	N/A	-	N/A	-	SG9113406BAL	1/17/2014
07/11/2013	10:35	NoxHigh_33	Nox	635.600	623.700	-11.900	-11.900	-	N/A	-	N/A	-	N/A	-	SG9147487BAL	4/29/2021
07/11/2013	09:51	NoxHigh_33	Nox	179.700	180.100	0.400	0.400	-	N/A	-	N/A	-	N/A	-	SG9148157BAL	5/2/2014
07/11/2013	09:51	NoxHigh_33	Nox	395.300	392.200	-3.100	-3.100	-	N/A	-	N/A	-	N/A	-	SG9113406BAL	1/17/2014
07/11/2013	09:51	NoxHigh_33	Nox	635.600	623.400	-12.200	-12.200	-	N/A	-	N/A	-	N/A	-	SG9147487BAL	4/29/2021
07/11/2013	09:09	NoxHigh_33	Nox	179.700	180.600	0.900	0.900	-	N/A	-	N/A	-	N/A	-	SG9148157BAL	5/2/2014
07/11/2013	09:09	NoxHigh_33	Nox	395.300	393.300	-2.000	-2.000	-	N/A	-	N/A	-	N/A	-	SG9113406BAL	1/17/2014
07/11/2013	09:09	NoxHigh_33	Nox	635.600	624.300	-11.300	-11.300	-	N/A	-	N/A	-	N/A	-	SG9147487BAL	4/29/2021

Linearity Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable Units	%	Bottle ID	Expire Date
07/11/2013	10:35	NOxLow_33	NOx	12.500	12.060	-0.440	-3.2	0.625	5.0	CC174083	11/3/2013
07/11/2013	10:35	NOxLow_33	NOx	27.510	26.590	-0.920	-3.3	1.375	5.0	CC332257	1/19/2014
07/11/2013	10:35	NOxLow_33	NOx	44.740	44.750	0.010	0.0	2.237	5.0	CC241669	2/19/2016
07/11/2013	09:51	NOxLow_33	NOx	12.500	12.060	-0.440	-3.2	0.625	5.0	CC174083	11/3/2013
07/11/2013	09:51	NOxLow_33	NOx	27.510	26.580	-0.930	-3.3	1.375	5.0	CC332257	1/19/2014
07/11/2013	09:51	NOxLow_33	NOx	44.740	44.680	-0.060	-0.2	2.237	5.0	CC241669	2/19/2016
07/11/2013	09:09	NOxLow_33	NOx	12.500	11.950	-0.550	-4.8	0.625	5.0	CC174083	11/3/2013
07/11/2013	09:09	NOxLow_33	NOx	27.510	26.480	-1.030	-3.6	1.375	5.0	CC332257	1/19/2014
07/11/2013	09:09	NOxLow_33	NOx	44.740	44.730	-0.010	0.0	2.237	5.0	CC241669	2/19/2016
07/11/2013	10:35	O2_33	O2	6.260	6.290	0.030	0.0	0.313	5.0	CC134940	1/23/2015
07/11/2013	10:35	O2_33	O2	13.720	13.880	0.160	1.5	0.686	5.0	CC349278	5/14/2015
07/11/2013	10:35	O2_33	O2	21.030	21.240	0.210	1.0	1.052	5.0	CC222250	2/18/2021
07/11/2013	09:51	O2_33	O2	6.260	6.290	0.030	0.0	0.313	5.0	CC134940	1/23/2015
07/11/2013	09:51	O2_33	O2	13.720	13.870	0.150	0.7	0.686	5.0	CC349278	5/14/2015
07/11/2013	09:51	O2_33	O2	21.030	21.230	0.200	1.0	1.052	5.0	CC222250	2/18/2021
07/11/2013	09:09	O2_33	O2	6.260	6.290	0.030	0.0	0.313	5.0	CC134940	1/23/2015
07/11/2013	09:09	O2_33	O2	13.720	13.880	0.160	1.5	0.686	5.0	CC349278	5/14/2015
07/11/2013	09:09	O2_33	O2	21.030	21.230	0.200	1.0	1.052	5.0	CC222250	2/18/2021

**FAIL** = Difference Error > Regulations Allow

**TARG** = Invalid Target (not within regulatory specs)

**RDG** = Reading exceeds "Range of Analyzer"

**Note:** 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

⊘ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Linearity Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel	----LOW----			----MID----			----HIGH----		
	Diff	Target	%	Diff	Target	%	Diff	Target	%
COHigh_33	39.000	- N/A -	- N/A -	31.000	- N/A -	- N/A -	34.667	- N/A -	- N/A -
COLow_33	0.533	- N/A -	- N/A -	0.010	- N/A -	- N/A -	0.843	- N/A -	- N/A -
NOxHigh_33	0.667	0.4%	0.4%	2.467	0.6%	0.6%	11.800	1.9%	1.9%
NOxLow_33	0.477	3.8%	3.8%	0.960	3.5%	3.5%	0.020	0.0%	0.0%
O2_33	0.030	0.5%	0.5%	0.157	1.1%	1.1%	0.203	1.0%	1.0%

Performance Specification

Channel	Performance Specification	
	PASS	FAIL
COHigh_33	- N/A -	- N/A -
COLow_33	- N/A -	- N/A -
NOxHigh_33	<=5.0%	>5.0%
NOxLow_33	<=5.0%	>5.0%
O2_33	<=5.0%	>5.0%

**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Signature: Joseph W. White Date: 7/11/13

Title: Signature: Bill Hayek Date: 7/11/13

**Babcock & Wilcox Power Generation Group NetDAHSE**

Version 84.0

CGA Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

Span of Analyzers:

O2	0.00	25.00 %O2	O2	0.00	25.00 %O2
CO	0.00	100.00 ppm	CO	0.00	100.00 ppm
COHigh_33	0	5000 ppm	CO	0	5000 ppm
NOx	0.00	50.00 ppm	NOx	0.00	50.00 ppm
NOxHigh_33	0.0	700.0 ppm	NOx	0.0	700.0 ppm

Date	Time	From	3 Pt.	Channel	Type	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/11/2013	10:35	*		COHigh_33	CO	1236.0	1275.0	39.0	3.2	185.4	15.0	CC174083	11/3/2013
07/11/2013	10:35	*		COHigh_33	CO	2810.0	2779.0	-31.0	-1.1	421.5	15.0	CC332257	1/19/2014
07/11/2013	09:51	*		COHigh_33	CO	1236.0	1275.0	39.0	3.2	185.4	15.0	CC174083	11/3/2013
07/11/2013	09:51	*		COHigh_33	CO	2810.0	2780.0	-30.0	-1.1	421.5	15.0	CC332257	1/19/2014
07/11/2013	09:09	*		COHigh_33	CO	1236.0	1275.0	39.0	3.2	185.4	15.0	CC174083	11/3/2013
07/11/2013	09:09	*		COHigh_33	CO	2810.0	2778.0	-32.0	-1.1	421.5	15.0	CC332257	1/19/2014
07/11/2013	10:35	*		COHigh_33	CO	24.9	25.4	0.5	2.0	3.7	15.0	CC134940	1/23/2015
07/11/2013	10:35	*		COHigh_33	CO	54.4	54.4	0.0	0.0	8.2	15.0	CC349278	5/14/2015
07/11/2013	09:51	*		COHigh_33	CO	24.9	25.4	0.5	2.0	3.7	15.0	CC134940	1/23/2015
07/11/2013	09:51	*		COHigh_33	CO	54.4	54.5	0.0	0.1	8.2	15.0	CC349278	5/14/2015
07/11/2013	09:09	*		COHigh_33	CO	24.9	25.5	0.6	2.4	3.7	15.0	CC134940	1/23/2015
07/11/2013	09:09	*		COHigh_33	CO	54.4	54.4	0.0	0.0	8.2	15.0	CC349278	5/14/2015
07/11/2013	10:35	*		NOxHigh_33	NOx	179.7	180.4	0.7	0.4	27.0	15.0	SG9148157BAL	5/2/2014
07/11/2013	10:35	*		NOxHigh_33	NOx	395.3	393.0	-2.3	-0.6	59.3	15.0	SG9113406BAL	1/17/2014
07/11/2013	09:51	*		NOxHigh_33	NOx	179.7	180.1	0.4	0.2	27.0	15.0	SG9148157BAL	5/2/2014
07/11/2013	09:51	*		NOxHigh_33	NOx	395.3	392.2	-3.1	-0.8	59.3	15.0	SG9113406BAL	1/17/2014
07/11/2013	09:09	*		NOxHigh_33	NOx	179.7	180.6	0.9	0.5	27.0	15.0	SG9148157BAL	5/2/2014
07/11/2013	09:09	*		NOxHigh_33	NOx	395.3	393.3	-2.0	-0.5	59.3	15.0	SG9113406BAL	1/17/2014
07/11/2013	10:35	*		NOxLow_33	NOx	12.5	12.1	-0.4	-3.5	1.9	15.0	CC174083	11/3/2013
07/11/2013	10:35	*		NOxLow_33	NOx	27.5	26.6	-0.9	-3.3	4.1	15.0	CC332257	1/19/2014
07/11/2013	09:51	*		NOxLow_33	NOx	12.5	12.1	-0.4	-3.5	1.9	15.0	CC174083	11/3/2013
07/11/2013	09:51	*		NOxLow_33	NOx	27.5	26.6	-0.9	-3.4	4.1	15.0	CC332257	1/19/2014
07/11/2013	09:09	*		NOxLow_33	NOx	12.5	11.9	-0.6	-4.4	1.9	15.0	CC174083	11/3/2013
07/11/2013	09:09	*		NOxLow_33	NOx	27.5	26.5	-1.0	-3.7	4.1	15.0	CC332257	1/19/2014
07/11/2013	10:35	*		O2_33	O2	6.3	6.3	0.0	0.5	0.9	15.0	CC134940	1/23/2015
07/11/2013	10:35	*		O2_33	O2	13.7	13.9	0.2	1.2	2.1	15.0	CC349278	5/14/2015

CGA Calibration Report  
Generated: 7/11/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/11/2013  
Period End: 7/11/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From 3 Pt.	Channel	Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	Bottle ID	Expire Date
07/11/2013	09:51	*	02_33	LOW	6.3	6.3	0.0	0.5	0.9	CCI34940 *	1/23/2015
07/11/2013	09:51	*	02_33	MID	13.7	13.9	0.1	1.1	2.1	CCI349278 *	5/14/2015
07/11/2013	09:09	*	02_33	LOW	6.3	6.3	0.0	0.5	0.9	CCI34940 *	1/23/2015
07/11/2013	09:09	*	02_33	MID	13.7	13.9	0.2	1.2	2.1	CCI349278 *	5/14/2015

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading/Target) \* 100

Channel	Diff Units	Target %	Diff Units	Target %
COHigh_33	39.0	3.2%	31.0	1.1%
COLow_33	0.5	2.1%	0.0	0.0%
NOXHigh_33	0.7	0.4%	2.5	0.6%
NOXLow_33	0.5	3.8%	1.0	3.5%
O2_33	0.0	0.5%	0.2	1.1%

#### Performance Specification

Channel	Performance Specification	FAIL
COHigh_33	CO	<=15.0%
COLow_33	CO	>15.0%
NOXHigh_33	NOX	<=15.0%
NOXLow_33	NOX	>15.0%
O2_33	O2	<=15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOX] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOX] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOX] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOX] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Signature: Date: 7/11/13

Title: Signature: Date: 7/11/13

Linearity Calibration Report  
Generated: 7/30/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/1/2013  
Period End: 7/30/2013  
Included Calibrations: **Linearity (40CFR75)**

## Range of Analyzers:

## Span of Analyzers:

Target	Actual	Diff	Error %	Units	Linearity Allowable (40CFR75)
25.00 %O2	25.00 %O2	0.00	0.00	0.00	25.00 %O2
50.00 ppm	50.00 ppm	0.00	0.00	0.00	50.00 ppm
700.0 ppm	700.0 ppm	0.0	0.0	0.0	700.0 ppm

Linearity Allowable (40CFR75)												
Date	Time	Channel	Type	Target	Actual	Diff	Error %	Units	Linearity Allowable	Bottle ID	Expire Date	
				Units	Units	Units						
07/24/2013	08:55	NoxHigh_34	Nox	179.700	186.200	6.500	3.6	8.985	5.0	PASS	SG9148157BAL	5/2/2014
07/24/2013	08:55	NoxHigh_34	Nox	395.300	404.500	9.200	2.3	19.765	5.0	PASS	SG9113406BAL	1/17/2014
07/24/2013	08:55	NoxHigh_34	Nox	635.600	639.700	4.100	0.6	31.780	5.0	PASS	SG9147487BAL	4/29/2021
07/24/2013	08:16	NoxHigh_34	Nox	179.700	186.100	6.400	3.6	8.985	5.0	PASS	SG9148157BAL	5/2/2014
07/24/2013	08:16	NoxHigh_34	Nox	395.300	404.000	8.700	2.2	19.765	5.0	PASS	SG9113406BAL	1/17/2014
07/24/2013	08:16	NoxHigh_34	Nox	635.600	639.400	3.800	0.6	31.780	5.0	PASS	SG9147487BAL	4/29/2021
07/24/2013	07:38	NoxHigh_34	Nox	179.700	186.100	6.400	3.6	8.985	5.0	PASS	SG9148157BAL	5/2/2014
07/24/2013	07:38	NoxHigh_34	Nox	395.300	404.100	8.800	2.2	19.765	5.0	PASS	SG9113406BAL	1/17/2014
07/24/2013	07:38	NoxHigh_34	Nox	635.600	638.500	2.900	0.5	31.780	5.0	PASS	SG9147487BAL	4/29/2021
07/24/2013	08:55	NoxLow_34	Nox	12.500	12.160	-0.340	-2.4	0.625	5.0	PASS	CC174083	11/8/2013
07/24/2013	08:55	NoxLow_34	Nox	27.510	26.840	-0.670	-2.5	1.375	5.0	PASS	CC332257	1/19/2014
07/24/2013	08:55	NoxLow_34	Nox	44.730	45.070	0.340	0.7	2.237	5.0	PASS	CC241669	2/19/2016
07/24/2013	08:16	NoxLow_34	Nox	12.500	12.200	-0.300	-2.4	0.625	5.0	PASS	CC174083	11/8/2013
07/24/2013	08:16	NoxLow_34	Nox	27.510	26.810	-0.700	-2.5	1.375	5.0	PASS	CC332257	1/19/2014
07/24/2013	08:16	NoxLow_34	Nox	44.730	45.020	0.290	0.7	2.237	5.0	PASS	CC241669	2/19/2016
07/24/2013	07:38	NoxLow_34	Nox	12.500	12.100	-0.400	-3.2	0.625	5.0	PASS	CC174083	11/8/2013
07/24/2013	07:38	NoxLow_34	Nox	27.510	26.770	-0.740	-2.5	1.375	5.0	PASS	CC332257	1/19/2014
07/24/2013	07:38	NoxLow_34	Nox	44.730	44.950	0.220	0.4	2.237	5.0	PASS	CC241669	2/19/2016
07/24/2013	08:55	O2_34	O2	6.260	6.330	0.070	1.6	0.313	5.0	PASS	CC134940	1/23/2015
07/24/2013	08:55	O2_34	O2	13.720	13.830	0.110	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/24/2013	08:55	O2_34	O2	21.030	21.110	0.080	0.5	1.052	5.0	PASS	CC222250	2/18/2021
07/24/2013	08:16	O2_34	O2	6.260	6.330	0.070	1.6	0.313	5.0	PASS	CC134940	1/23/2015
07/24/2013	08:16	O2_34	O2	13.720	13.830	0.110	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/24/2013	08:16	O2_34	O2	21.030	21.110	0.080	0.5	1.052	5.0	PASS	CC222250	2/18/2021
07/24/2013	07:38	O2_34	O2	6.260	6.330	0.070	1.6	0.313	5.0	PASS	CC134940	1/23/2015
07/24/2013	07:38	O2_34	O2	13.720	13.830	0.110	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/24/2013	07:38	O2_34	O2	21.030	21.100	0.070	0.5	1.052	5.0	PASS	CC222250	2/18/2021

FAIL = Difference Error &gt; Regulations Allow

TARG = Invalid Target (not within regulatory specs)

RDG = Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

# Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

## Babcock &amp; Wilcox Power Generation Group NetDAHS®

Linearity Calibration Report  
Generated: 7/30/2013

Period Start: 7/1/2013  
Period End: 7/30/2013  
Included Calibrations: **Linearity (40CFR75)**

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: slack

Absolute Average Diff and Absolute (Target - Average Reading) / (Target) \* 100

Channel	----LOW----		----MID----		----HIGH----	
	Diff	Target	Diff	Target	Diff	Target
NOxHigh_34	Units	%	Units	%	Units	%
NOxLow_34	6.433	3.6%	8.900	2.3%	3.600	0.6%
O2_34	0.347	2.8%	0.703	2.6%	0.283	0.6%
	0.070	1.1%	0.110	0.8%	0.077	0.4%

## Performance Specification

Channel	PASS	FAIL
NOxHigh_34	NOx	<=5.0%
NOxLow_34	NOx	<=5.0%
O2_34	O2	<=5.0%

**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: \_\_\_\_\_ Signature: *Bill Hayth* Date: 7/24/13

# Babcock & Wilcox Power Generation Group NetDAR80

Version 84.0

CGA Calibration Report  
Generated: 7/30/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/1/2013  
Period End: 7/30/2013  
Included Calibrations: CGA (40CFR60)

## Range of Analyzers:

## Span of Analyzers:

O2_34	0.00	25.00 %O2	O2	0.00	25.00 %O2
CO_Low_34	0.00	100.00 ppm	CO	0.00	100.00 ppm
CO_High_34	0	5000 ppm	CO	0	5000 ppm
NOxLow_34	0.00	50.00 ppm	NOx	0.00	50.00 ppm
NOxHigh_34	0.0	700.0 ppm	NOx	0.0	700.0 ppm

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/24/2013	08:55	3 Pt.	CO_High_34	CO	1236.0	1224.0	-12.0	-1.0	185.4	15.0	CC174083	11/8/2013
07/24/2013	08:55	*	CO	CO	2810.0	2769.0	-41.0	-1.5	421.5	15.0	CC332257	1/19/2014
07/24/2013	08:16	*	CO_High_34	CO	1236.0	1224.0	-12.0	-1.0	185.4	15.0	CC174083	11/8/2013
07/24/2013	08:16	*	CO	CO	2810.0	2769.0	-41.0	-1.5	421.5	15.0	CC332257	1/19/2014
07/24/2013	07:38	*	CO_High_34	CO	1236.0	1222.0	-14.0	-1.1	185.4	15.0	CC174083	11/8/2013
07/24/2013	07:38	*	CO	CO	2810.0	2767.0	-43.0	-1.5	421.5	15.0	CC332257	1/19/2014
07/24/2013	08:55	*	CO_High_34	CO	24.9	25.3	0.4	1.5	3.7	15.0	CC134940	1/23/2015
07/24/2013	08:55	*	CO_Low_34	CO	54.4	54.6	0.2	0.3	8.2	15.0	CC349278	5/14/2015
07/24/2013	08:16	*	CO_Low_34	CO	24.9	25.3	0.4	1.5	3.7	15.0	CC134940	1/23/2015
07/24/2013	08:16	*	CO	CO	54.4	54.6	0.2	0.4	8.2	15.0	CC349278	5/14/2015
07/24/2013	07:38	*	CO_Low_34	CO	24.9	25.9	1.0	3.9	3.7	15.0	CC134940	1/23/2015
07/24/2013	07:38	*	CO	CO	54.4	54.8	0.3	0.6	8.2	15.0	CC349278	5/14/2015
07/24/2013	08:55	*	NOxHigh_34	NOx	179.7	186.2	6.5	3.6	27.0	15.0	SG9148157BAL	5/2/2014
07/24/2013	08:55	*	NOxHigh_34	NOx	395.3	404.5	9.2	2.3	59.3	15.0	SG9113406BAL	1/17/2014
07/24/2013	08:16	*	NOxHigh_34	NOx	179.7	186.1	6.4	3.6	27.0	15.0	SG9148157BAL	5/2/2014
07/24/2013	07:38	*	NOxHigh_34	NOx	395.3	404.0	8.7	2.2	59.3	15.0	SG9113406BAL	1/17/2014
07/24/2013	07:38	*	NOxHigh_34	NOx	179.7	186.1	6.4	3.6	27.0	15.0	SG9148157BAL	5/2/2014
07/24/2013	08:55	*	NOxLow_34	NOx	12.5	12.2	-0.3	-2.7	1.9	15.0	SG9113406BAL	1/17/2014
07/24/2013	08:55	*	NOxLow_34	NOx	27.5	26.8	-0.7	-2.4	4.1	15.0	CC174083	11/8/2013
07/24/2013	08:16	*	NOxLow_34	NOx	12.5	12.2	-0.3	-2.4	1.9	15.0	CC332257	1/19/2014
07/24/2013	08:16	*	NOxLow_34	NOx	27.5	26.8	-0.7	-2.5	4.1	15.0	CC174083	11/8/2013
07/24/2013	07:38	*	NOxLow_34	NOx	12.5	12.1	-0.4	-3.2	1.9	15.0	CC332257	1/19/2014
07/24/2013	07:38	*	NOxLow_34	NOx	27.5	26.8	-0.7	-2.7	4.1	15.0	CC134940	1/23/2015
07/24/2013	08:55	*	O2_34	O2	6.3	6.3	0.1	1.1	0.9	15.0	CC349278	5/14/2015
07/24/2013	08:55	*	O2_34	O2	13.7	13.8	0.1	0.8	2.1	15.0	CC349278	5/14/2015

Babcock & Wilcox Power Generation Group NetDAHse

CGA Calibration Report  
Generated: 7/30/2013

Period Start: 7/1/2013  
Period End: 7/30/2013  
Included Calibrations: CGA (40CFR60)

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/24/2013	08:16	*	O2_34	O2	13.7	13.7	0.1	0.8	2.1	CC134940	1/23/2015
07/24/2013	08:16	*	O2_34	O2	13.7	13.7	0.1	0.8	2.1	CC134940	1/23/2015
07/24/2013	07:38	*	O2_34	O2	13.7	13.7	0.1	0.8	2.1	CC134940	1/23/2015
07/24/2013	07:38	*	O2_34	O2	13.7	13.7	0.1	0.8	2.1	CC134940	1/23/2015

**FAIL** = Difference Error > Regulations Allow  
**TARG** = Invalid Target (not within regulatory specs)  
**RDG** = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/(Target) \* 100

Channel	Diff	Target	Units	Diff	Target	%
COHigh_34	12.7	1.0%	41.7	1.5%	0.4%	
COLow_34	0.6	2.3%	0.2	0.4%	2.3%	
NOxHigh_34	6.4	3.6%	8.9	2.6%	0.8%	
NOxLow_34	0.3	2.8%	0.7	2.6%	0.8%	
O2_34	0.1	1.1%	0.1	0.8%	0.8%	

Performance Specification

Channel	FAIL	PASS
COHigh_34	>15.0%	<=15.0%
COLow_34	>15.0%	<=15.0%
NOxHigh_34	>15.0%	<=15.0%
NOxLow_34	>15.0%	<=15.0%
O2_34	>15.0%	<=15.0%

**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Signature: Date: 7/24/13

# Babcock & Wilcox Power Generation Group NetDAH®

Version B4.0

Linearity Calibration Report  
Generated: 7/25/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/25/2013  
Period End: 7/25/2013  
Included Calibrations: **Linearity (40CFR75)**

## Range of Analyzers:

Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Span of Analyzers:
07/25/2013 15:17	NOxHigh_36	NOx	179,700	181,600	1,900	1.1	8,985	25.00 %O2
07/25/2013 15:17	NOxHigh_36	NOx	395,300	399,400	4,100	1.0	19,765	50.00 ppm
07/25/2013 15:17	NOxHigh_36	NOx	635,600	642,100	6,500	1.0	31,780	700.0 ppm
07/25/2013 14:39	NOxHigh_36	NOx	179,700	181,700	2,000	1.1	8,985	
07/25/2013 14:39	NOxHigh_36	NOx	395,300	399,600	4,300	1.1	19,765	
07/25/2013 14:39	NOxHigh_36	NOx	635,600	642,700	7,100	1.1	31,780	
07/25/2013 13:58	NOxHigh_36	NOx	179,700	182,100	2,400	1.3	19,765	
07/25/2013 13:58	NOxHigh_36	NOx	395,300	400,500	5,200	1.3	31,780	
07/25/2013 13:58	NOxHigh_36	NOx	635,600	643,900	8,300	1.3	41,780	
07/25/2013 15:17	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	
07/25/2013 15:17	NOxLow_36	NOx	27,510	27,070	-440	-1.6	1,375	
07/25/2013 15:17	NOxLow_36	NOx	44,730	45,490	760	1.8	2,237	
07/25/2013 14:39	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	
07/25/2013 14:39	NOxLow_36	NOx	27,510	27,090	-420	-1.5	1,375	
07/25/2013 14:39	NOxLow_36	NOx	44,730	45,530	800	1.8	2,237	
07/25/2013 13:58	NOxLow_36	NOx	12,500	12,290	-210	-1.6	0,625	
07/25/2013 13:58	NOxLow_36	NOx	27,510	27,110	-400	-1.5	1,375	
07/25/2013 13:58	NOxLow_36	NOx	44,730	45,630	900	2.0	2,237	
07/25/2013 15:17	O2_36	O2	6,260	6,270	10	0.0	0,313	
07/25/2013 15:17	O2_36	O2	13,720	13,790	70	0.7	0,686	
07/25/2013 15:17	O2_36	O2	21,030	21,070	40	0.0	1,052	
07/25/2013 14:39	O2_36	O2	6,260	6,270	10	0.0	0,313	
07/25/2013 14:39	O2_36	O2	13,720	13,780	60	0.7	0,686	
07/25/2013 14:39	O2_36	O2	21,030	21,060	30	0.0	1,052	
07/25/2013 13:58	O2_36	O2	6,260	6,260	0	0.0	0,313	
07/25/2013 13:58	O2_36	O2	13,720	13,780	60	0.7	0,686	
07/25/2013 13:58	O2_36	O2	21,030	21,060	30	0.0	1,052	

## Span of Analyzers:

Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Span of Analyzers:
07/25/2013 15:17	NOxHigh_36	NOx	179,700	181,600	1,900	1.1	8,985	25.00 %O2
07/25/2013 15:17	NOxHigh_36	NOx	395,300	399,400	4,100	1.0	19,765	50.00 ppm
07/25/2013 15:17	NOxHigh_36	NOx	635,600	642,100	6,500	1.0	31,780	700.0 ppm
07/25/2013 14:39	NOxHigh_36	NOx	179,700	181,700	2,000	1.1	8,985	
07/25/2013 14:39	NOxHigh_36	NOx	395,300	399,600	4,300	1.1	19,765	
07/25/2013 14:39	NOxHigh_36	NOx	635,600	642,700	7,100	1.1	31,780	
07/25/2013 13:58	NOxHigh_36	NOx	179,700	182,100	2,400	1.3	19,765	
07/25/2013 13:58	NOxHigh_36	NOx	395,300	400,500	5,200	1.3	31,780	
07/25/2013 13:58	NOxHigh_36	NOx	635,600	643,900	8,300	1.3	41,780	
07/25/2013 15:17	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	
07/25/2013 15:17	NOxLow_36	NOx	27,510	27,070	-440	-1.6	1,375	
07/25/2013 15:17	NOxLow_36	NOx	44,730	45,490	760	1.8	2,237	
07/25/2013 14:39	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	
07/25/2013 14:39	NOxLow_36	NOx	27,510	27,090	-420	-1.5	1,375	
07/25/2013 14:39	NOxLow_36	NOx	44,730	45,530	800	1.8	2,237	
07/25/2013 13:58	NOxLow_36	NOx	12,500	12,290	-210	-1.6	0,625	
07/25/2013 13:58	NOxLow_36	NOx	27,510	27,110	-400	-1.5	1,375	
07/25/2013 13:58	NOxLow_36	NOx	44,730	45,630	900	2.0	2,237	
07/25/2013 15:17	O2_36	O2	6,260	6,270	10	0.0	0,313	
07/25/2013 15:17	O2_36	O2	13,720	13,790	70	0.7	0,686	
07/25/2013 15:17	O2_36	O2	21,030	21,070	40	0.0	1,052	
07/25/2013 14:39	O2_36	O2	6,260	6,270	10	0.0	0,313	
07/25/2013 14:39	O2_36	O2	13,720	13,780	60	0.7	0,686	
07/25/2013 14:39	O2_36	O2	21,030	21,060	30	0.0	1,052	
07/25/2013 13:58	O2_36	O2	6,260	6,260	0	0.0	0,313	
07/25/2013 13:58	O2_36	O2	13,720	13,780	60	0.7	0,686	
07/25/2013 13:58	O2_36	O2	21,030	21,060	30	0.0	1,052	

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Bottle ID	Expire Date
07/25/2013	15:17	NOxHigh_36	NOx	179,700	181,600	1,900	1.1	8,985	SG9148157	5/2/2014
07/25/2013	15:17	NOxHigh_36	NOx	395,300	399,400	4,100	1.0	19,765	SG9113406BAL	1/17/2014
07/25/2013	15:17	NOxHigh_36	NOx	635,600	642,100	6,500	1.0	31,780	SG9147487BAL	4/29/2021
07/25/2013	14:39	NOxHigh_36	NOx	179,700	181,700	2,000	1.1	8,985	SG9148157	5/2/2014
07/25/2013	14:39	NOxHigh_36	NOx	395,300	399,600	4,300	1.1	19,765	SG9113406BAL	1/17/2014
07/25/2013	14:39	NOxHigh_36	NOx	635,600	642,700	7,100	1.1	31,780	SG9147487BAL	4/29/2021
07/25/2013	13:58	NOxHigh_36	NOx	179,700	182,100	2,400	1.3	19,765	SG9148157	5/2/2014
07/25/2013	13:58	NOxHigh_36	NOx	395,300	400,500	5,200	1.3	31,780	SG9113406BAL	1/17/2014
07/25/2013	13:58	NOxHigh_36	NOx	635,600	643,900	8,300	1.3	41,780	SG9147487BAL	4/29/2021
07/25/2013	15:17	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	CC174083	11/3/2013
07/25/2013	15:17	NOxLow_36	NOx	27,510	27,070	-440	-1.6	1,375	CC332257	1/19/2014
07/25/2013	15:17	NOxLow_36	NOx	44,730	45,490	760	1.8	2,237	CC241669	2/19/2016
07/25/2013	14:39	NOxLow_36	NOx	12,500	12,300	-200	-1.6	0,625	CC174083	11/3/2013
07/25/2013	14:39	NOxLow_36	NOx	27,510	27,090	-420	-1.5	1,375	CC332257	1/19/2014
07/25/2013	14:39	NOxLow_36	NOx	44,730	45,530	800	1.8	2,237	CC241669	2/19/2016
07/25/2013	13:58	NOxLow_36	NOx	12,500	12,290	-210	-1.6	0,625	CC174083	11/3/2013
07/25/2013	13:58	NOxLow_36	NOx	27,510	27,110	-400	-1.5	1,375	CC332257	1/19/2014
07/25/2013	13:58	NOxLow_36	NOx	44,730	45,630	900	2.0	2,237	CC241669	2/19/2016
07/25/2013	15:17	O2_36	O2	6,260	6,270	10	0.0	0,313	CC134940	1/23/2015
07/25/2013	15:17	O2_36	O2	13,720	13,790	70	0.7	0,686	CC349278	5/14/2015
07/25/2013	15:17	O2_36	O2	21,030	21,070	40	0.0	1,052	CC222250	2/18/2021
07/25/2013	14:39	O2_36	O2	6,260	6,270	10	0.0	0,313	CC134940	1/23/2015
07/25/2013	14:39	O2_36	O2	13,720	13,780	60	0.7	0,686	CC349278	5/14/2015
07/25/2013	14:39	O2_36	O2	21,030	21,060	30	0.0	1,052	CC222250	2/18/2021
07/25/2013	13:58	O2_36	O2	6,260	6,260	0	0.0	0,313	CC134940	1/23/2015
07/25/2013	13:58	O2_36	O2	13,720	13,780	60	0.7	0,686	CC349278	5/14/2015
07/25/2013	13:58	O2_36	O2	21,030	21,060	30	0.0	1,052	CC222250	2/18/2021

**FAIL** = Difference Error > Regulations Allow  
**TARG** = Invalid Target (not within regulatory specs)  
**RDG** = Reading exceeds "Range of Analyzer"  
**Note:** 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration  
 # Bottle has Expired - Must be Replaced

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/25/2013  
Period End: 7/25/2013  
Included Calibrations: Linearity (40CFR75)

Linearity Calibration Report  
Generated: 7/25/2013

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel	----LOW----		----MID----		----HIGH----	
	Diff	Target	Diff	Target	Diff	Target
NOxHigh_36	2.100	1.2%	4.533	1.1%	7.300	1.1%
NOxLow_36	0.203	1.6%	0.420	1.5%	0.820	1.8%
O2_36	0.007	0.1%	0.063	0.5%	0.033	0.2%

Performance Specification

Channel	PASS	FAIL
NOxHigh_36	<=5.0%	>5.0%
NOxLow_36	<=5.0%	>5.0%
O2_36	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Signature: Date: / /  
Signature: *Bill Hays* Date: 7/25/13

**Babcock & Wilcox Power Generation Group NetDAISE**

Version 84.0

CGA Calibration Report  
Generated: 7/25/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 7/25/2013  
Period End: 7/25/2013  
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_36	O2	0.00
CO_Low_36	CO	0.00
CO_High_36	CO	0
NOx_Low_36	NOx	0.00
NOx_High_36	NOx	0.0

Span of Analyzers:

O2_36	O2	0.00	25.00 %O2
CO_Low_36	CO	0.00	100.00 ppm
CO_High_36	CO	0	5000 ppm
NOx_Low_36	NOx	0.00	50.00 ppm
NOx_High_36	NOx	0.0	700.0 ppm

Date	Time	From	3 Pt.	Channel	Type	Target	Actual	Diff	Error	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
07/25/2013	15:17	*		CO_High_36	CO	1236.00	1261.00	25.00	2.0	185.40	15.0	CC174083	11/3/2013
07/25/2013	15:17	*		CO_Low_36	CO	2810.00	2811.00	1.00	0.0	421.50	15.0	CC332257	11/19/2014
07/25/2013	14:39	*		CO_High_36	CO	1236.00	1261.00	25.00	2.0	185.40	15.0	CC174083	11/3/2013
07/25/2013	14:39	*		CO_High_36	CO	2810.00	2808.00	-2.00	-0.1	421.50	15.0	CC332257	11/19/2014
07/25/2013	13:58	*		CO_Low_36	CO	1236.00	1259.00	23.00	1.9	185.40	15.0	CC174083	11/3/2013
07/25/2013	13:58	*		CO_High_36	CO	2810.00	2805.00	-5.00	-0.2	421.50	15.0	CC332257	11/19/2014
07/25/2013	15:17	*		CO_Low_36	CO	24.90	25.35	0.45	1.8	3.74	15.0	CC134940	1/23/2015
07/25/2013	15:17	*		CO_Low_36	CO	54.43	54.96	0.53	1.0	8.16	15.0	CC349278	5/14/2015
07/25/2013	14:39	*		CO_Low_36	CO	24.90	25.30	0.40	1.6	3.74	15.0	CC134940	1/23/2015
07/25/2013	14:39	*		CO_Low_36	CO	54.43	55.00	0.57	1.0	8.16	15.0	CC349278	5/14/2015
07/25/2013	13:58	*		CO_Low_36	CO	24.90	25.37	0.47	1.9	3.74	15.0	CC134940	1/23/2015
07/25/2013	13:58	*		CO_Low_36	CO	54.43	54.80	0.37	0.7	8.16	15.0	CC349278	5/14/2015
07/25/2013	15:17	*		NOx_High_36	NOx	179.70	181.60	1.90	1.1	26.96	15.0	SG9148157	5/2/2014
07/25/2013	15:17	*		NOx_High_36	NOx	395.30	399.40	4.10	1.0	59.30	15.0	SG9113406BAL	11/17/2014
07/25/2013	14:39	*		NOx_High_36	NOx	179.70	181.70	2.00	1.1	26.96	15.0	SG9148157	5/2/2014
07/25/2013	14:39	*		NOx_High_36	NOx	395.30	399.60	4.30	1.1	59.30	15.0	SG9113406BAL	11/17/2014
07/25/2013	13:58	*		NOx_High_36	NOx	179.70	182.10	2.40	1.3	26.96	15.0	SG9148157	5/2/2014
07/25/2013	13:58	*		NOx_High_36	NOx	395.30	400.50	5.20	1.3	59.30	15.0	SG9113406BAL	11/17/2014
07/25/2013	15:17	*		NOx_Low_36	NOx	12.50	12.30	-0.20	-1.6	1.88	15.0	CC174083	11/3/2013
07/25/2013	15:17	*		NOx_Low_36	NOx	27.51	27.07	-0.44	-1.6	4.13	15.0	CC332257	11/19/2014
07/25/2013	14:39	*		NOx_Low_36	NOx	12.50	12.30	-0.20	-1.6	1.88	15.0	CC174083	11/3/2013
07/25/2013	14:39	*		NOx_Low_36	NOx	27.51	27.09	-0.42	-1.5	4.13	15.0	CC332257	11/19/2014
07/25/2013	13:58	*		NOx_Low_36	NOx	12.50	12.29	-0.21	-1.7	1.88	15.0	CC174083	11/3/2013
07/25/2013	13:58	*		NOx_Low_36	NOx	27.51	27.11	-0.40	-1.5	4.13	15.0	CC332257	11/19/2014
07/25/2013	15:17	*		O2_36	O2	6.26	6.27	0.01	0.2	0.94	15.0	CC134940	1/23/2015
07/25/2013	15:17	*		O2_36	O2	13.72	13.79	0.07	0.5	2.06	15.0	CC349278	5/14/2015

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

CGA Calibration Report  
Generated: 7/25/2013

Period Start: 7/25/2013  
Period End: 7/25/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	Error	CGA Allowable	Bottle ID	Expire Date
07/25/2013	14:39	*	02_36	02	6.26	6.27	0.01	0.2	0.94	CC134940	1/23/2015
07/25/2013	14:39	*	02_36	02	13.72	13.78	0.06	0.4	2.06	CC349278	5/14/2015
07/25/2013	13:58	*	02_36	02	6.26	6.26	0.00	0.0	0.94	CC134940	1/23/2015
07/25/2013	13:58	*	02_36	02	13.72	13.78	0.06	0.4	2.06	CC349278	5/14/2015

**FAIL** = Difference Error > Regulations Allow  
**TARG** = Invalid Target (not within regulatory specs)  
**RDG** = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target \* 100

-----LOW-----				-----MID-----			
Channel	Diff	Target	Units	Diff	Target	Units	%
COHigh_36	24.33	2.01	2.00	0.1%			
COLow_36	0.44	1.81	0.49	0.9%			
NOxHigh_36	2.10	1.21	4.53	1.1%			
NOxLow_36	0.20	1.61	0.42	1.5%			
O2_36	0.01	0.11	0.06	0.5%			

Performance Specification

Channel	PASS	FAIL
COHigh_36	<=15.0%	>15.0%
COLow_36	<=15.0%	>15.0%
NOxHigh_36	<=15.0%	>15.0%
NOxLow_36	<=15.0%	>15.0%
O2_36	<=15.0%	>15.0%

**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

*Bill Hayle 7/25/13*


## **Attachment D**

### **New HU CEMS Report**

**PART 70 OPERATING PERMIT  
CERTIFICATION**

Source Name: Praxair Inc.  
Source Address: 2551 Dickey Road, East Chicago, IN 46312  
Mailing Address: P.O. Box 710, Whiting, Indiana 46394-0710  
Permit No.: T089-6741-00453  
Last updated on April 23, 2013 per SPM 089-32755-00453

<b>Praxair shall include this certification when submitting monitoring, testing reports/results or other documents to BP and requires BP RO certification.</b>	
Please check what document is being certified:	
<input type="checkbox"/>	Annual Compliance Certification Letter
<input type="checkbox"/>	Test Results (specify)
<input checked="" type="checkbox"/>	Report (specify): Quarterly CEMS Report – 3 <sup>rd</sup> Quarter 2013
<input type="checkbox"/>	Notification (specify)
<input type="checkbox"/>	Affidavit (specify)
<input type="checkbox"/>	Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	
Printed Name:	Andrew Campbell
Title/Position:	Facility Manager
Phone:	219-378-4854
Date:	10/15/13



Praxair Inc  
2551 Dickey Rd  
East Chicago, IN 46312

October 15, 2013

Ms. Linda Wilson  
Environmental Superintendent  
BP Products North America Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394-0710

Re: CEM Summary Performance Report – 3<sup>rd</sup> Quarter 2013

Dear Ms. Wilson,

Please find attached the Continuous Emission Monitor (CEM) summary performance reports for the New Hydrogen Unit owned by Praxair.

This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453 Significant Permit Modification (SPM) No. 089-32755-00453 issued on April 23, 2013 and reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). This report covers NO<sub>x</sub> and CO emissions from SMR 5 (HU-1) and SMR 6 (HU-2) as well as SO<sub>2</sub> emissions from the flare (HU Flare) for the period beginning on July 1, 2013 through September 30, 2013. HU flare and SMR6 operated continuously throughout the quarter. SMR5 was shut down mode in July and August and operated 566 hours in September 2013.

The CEMS unit on SMR 5 (HU-1) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-5 on September 18, 2013.

The CEMS unit on SMR 6 (HU-2) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-6 on September 18, 2013.

The HU flare SOLA operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for Flare SOLA on September 18, 2013.



Praxair Inc  
2551 Dickey Rd  
East Chicago, IN 46312

Monitoring requirements for HU Flare are conducted under an Alternative Monitoring Plan (AMP) approved by USEPA by means of a letter dated June 8, 2010. The AMP allows for the monitoring of total sulfur at the flare in the form of SO<sub>2</sub> instead of H<sub>2</sub>S.

Per 40 CFR 60.7(c) and (d) and per 326 IAC 3-5-7 the following reports are attached to this cover letter:

SMR 5 (HU-1)

- NOx @ 0% O<sub>2</sub> 40 ppm at 30 day rolling average Summary Report
- NOx @ 3% O<sub>2</sub> Summary Report
- CO @ 3% O<sub>2</sub> Summary Report
- Cylinder Gas Audit Report

SMR 6 (HU-2) (Shut down during the first quarter of 2013)

- NOx @ 0% O<sub>2</sub> 40 ppm at 30 day rolling average Report
- NOx @ 3% O<sub>2</sub> Summary Report
- CO @ 3% O<sub>2</sub> Summary Report
- Cylinder Gas Audit Report

HU Flare

- SO<sub>2</sub> 152 ppm Summary Report
- Cylinder Gas Audit Report

If you have any questions or comments about this report or the information contained with it, please contact Kiranmai Valluri at (281) 478-1564.

Sincerely,

A handwritten signature in black ink, appearing to read "A. Campbell", is written over a horizontal line.

Andrew Campbell  
Facility Manager

# SMR5-HU1 Summary Report

## NOx@0% Excess Emission and Monitoring System Performance

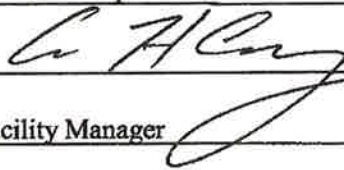
Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 30 day average NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	566.0 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
<b>CEMS Performance Summary</b>		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	5.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
7	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.9	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 10/15/2013

# SMR5-HU1 Summary Report

## NOx@3% Excess Emission and Monitoring System Performance

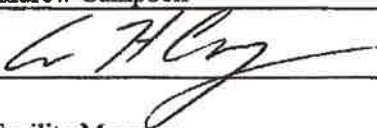
Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit- Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	566.0 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
<b>CEMS Performance Summary</b>		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	5.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.9	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 10/15/2013

# SMR5-HU1 Summary Report

## CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	566.0 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:	
a. Startup/shutdown	0.0 hr
b. Control equipment problems	0.0 hr
c. Process problems	0.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total duration of excess emissions.	0.0 hr
3. Percentage total duration of excess emissions of total source operating time.	0.0 %

### CEMS Performance Summary

1. CEMS downtime in reporting due to:	
a. Monitor equipment malfunctions	0.0 hr
b. Non-Monitor equipment malfunctions	0.0 hr
c. Quality assurance calibration	5.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total CEMS Downtime.	5.0 hr
3. Percentage total CEMS Downtime of total source operating time.	0.9 %

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 10/15/2013

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

SMR5-HU1 CEMS Downtime-NOx

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
9/18/2013	9:00	9/18/2013	14:00	5.00	CGA	None

Total hours

5

SMR5-HU1 CEMS Downtime-CO

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
9/18/2013	9:00	9/18/2013	14:00	5.00	CGA	None

Total hours

5



## SMR6-HU2 Summary Report

### NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 24-hour NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

#### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	6.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	6.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.3	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

10/15/2013

## SMR6-HU2 Summary Report

### NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

#### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	6.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	6.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.3	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

10/15/2013

# SMR6-HU2 Summary Report

## CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	6.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	6.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.3	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

10/15/2013

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

#### SMR6-HU2 CEMS Downtime-NOx

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration</u>	<u>Reason</u>	<u>Action Taken</u>
9/18/2013	11:00	9/18/2013	17:00	6.0	CGA	None

Total hours 6

#### SMR6-HU2 CEMS Downtime-CO

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration</u>	<u>Reason</u>	<u>Action Taken</u>
9/18/2013	11:00	9/18/2013	17:00	6.0	CGA	None

Total hours 6

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 Excess Emission Periods: NOx 40ppm@0% 24-Hours

<u>Start Date</u>	<u>Start Time</u>	<u>End Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
-------------------	-------------------	-----------------	-----------------	----------------------	---------------	---------------------

There were no excess emission from SMR 6 (HU-2) in third quarter of 2013.

Total hours 0.00

## HU Flare Summary Report

### SO2 Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	152 ppm SO2 - NSPS J
Monitor Manufacturer:	Thermo Scientific SOLA II
Monitor Model No.:	SL-06230909
Date of Latest CEMS Certification:	10/24/2012(RATA)
Process Unit Description:	Hydrogen Unit Flare
Total Source Operating Time:	2208.0 hours

#### Emission Data Summary

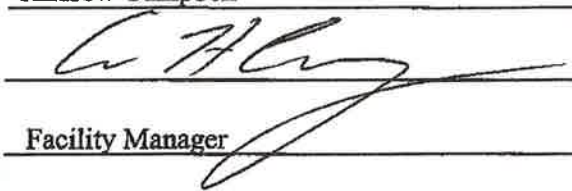
1. Duration of excess emissions in reporting period due to:	
a. Startup/shutdown	0.0 hr
b. Control equipment problems	0.0 hr
c. Process problems	0.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total duration of excess emissions.	0.0 hr
3. Percentage total duration of excess emissions of total source operating time.	0.0 %

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:	
a. Monitor equipment malfunctions	6.0 hr
b. Non-Monitor equipment malfunctions	0.0 hr
c. Quality assurance calibration	1.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total CEMS Downtime.	7.0 hr
3. Percentage total CEMS Downtime of total source operating time.	0.3 %

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

10/15/2013

Reporting period dates:	July 1, 2013 to September 30, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

#### HU Flare CEMS Downtime-SO2

<u>Start Date</u>	<u>Start Time</u>	<u>End Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
7/8/2013	9:00	7/8/2013	15:00	6	4x failure	Re - calibration
9/18/2013	14:00	9/18/2013	15:00	1	CGA	None

Total hours

7.0





**CONTINUOUS EMISSIONS MONITORING SYSTEM  
CYLINDER GAS AUDIT**

*Performed At The*  
**Praxair, Inc.**  
**Hydrogen Unit**  
**Reformer 5 (HU 1)**  
**Reformer 6 (HU 2)**  
**HU Flare**  
**Whiting, Indiana**

*Test Date*  
**September 18, 2013**

*Report No.*  
**TRC Environmental Corporation Report 202965.1000.0000B**

*Report Submittal Date*  
**October 14, 2013**

TRC Environmental Corporation  
7521 Brush Hill Road  
Burr Ridge, Illinois 60527  
USA

T (312) 533-2042  
F (312) 533-2070



## TABLE OF CONTENTS

	Page
Certification Sheet.....	i
General Information .....	1
Audit Results .....	1
Appendix	
Cylinder Gas Audit Data Sheet.....	A
Computer Data .....	B
Audit Gas Certification Sheets .....	C



## CERTIFICATION SHEET

On January 18, 2013, TRC Environmental Corporation (TRC) acquired the assets of the GEII Emissions Testing business. All work performed prior to this date was completed under the auspices of GEII. It is TRC's intent to merge the acquired emission testing groups with TRC's Air Measurements Practice as quickly as possible. However, we will continue to operate in parallel (i.e., under existing Quality Management Systems) until we confirm that procedures are harmonized.

I certify that TRC and its subcontractors (if any) operated in conformance with the requirements of ASTM D 7036-04 during this test project. The validity of any data not generated by TRC or its subcontractors is the responsibility of the organization that provided said data.

TRC Environmental Corporation

---

David McNulty  
Instrumentation Engineer/Manager CEMS Services



## CONTINUOUS EMISSIONS MONITORING SYSTEM CYLINDER GAS AUDIT

### 1.0 INTRODUCTION

A continuous emissions monitoring (CEM) system cylinder gas audit was performed by TRC Environmental Corporation (TRC) on September 18, 2013, at the Hydrogen Unit Reformer 5 (HU 1), Hydrogen Unit Reformer 6 (HU 2) and Hydrogen Unit Flare of Praxair Whiting plant in Whiting Indiana. The tests were authorized by Praxair, Inc.

The CEMS system was challenged three times at two audit points and the average responses were used in determining accuracy. All work was performed in accordance with 40 CFR 60, Appendix B, Performance Specification 2, and Appendix F.

### 1.1 Project Contact Information

Participants		
Test Facility	Praxair, Inc. Praxair Hydrogen Unit Whiting, Indiana 46312	Ms. Kiranmai Valluri Environmental Manager 281-478-1564 (phone) kiranmai_valluri@praxair.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. David McNulty Instrumentation Engineer/Manager CEM Services 312-533-2029 (phone) 312-533-2070 (fax) dmcnulty@trcsolutions.com

The tests were conducted by Mr. David McNulty of TRC.

## 2.0 SUMMARY OF RESULTS

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 5/HU 1	NO <sub>x</sub> Low	-3.42	-0.72	Pass
	NO <sub>x</sub> High	-2.75	-3.79	Pass
	CO Low	1.33	1.91	Pass
	CO High	2.43	1.86	Pass
	O <sub>2</sub>	-5.13	1.18	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 6/HU 2	NO <sub>x</sub> Low	-0.74	0.18	Pass
	NO <sub>x</sub> High	-5.11	-4.10	Pass
	CO Low	-1.33	0.70	Pass
	CO High	2.04	1.19	Pass
	O <sub>2</sub>	-2.53	0.17	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (+/-0.00-15.00%) Fail (+/-15.01%->)
		Audit Point 1	Audit Point 2	
HU Flare	SO <sub>2</sub>	0.22	0.18	Pass

## **APPENDIX**

## **Appendix A: Cylinder Gas Audit Field Data Sheets**

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Third Quarter  
Client: Praxair  
Unit: SMR 5 - HU1 Stack  
Project Number: 202955.1000.0000  
Auditor: David McNulty

Date of Audit: September 18, 2013  
Plant Name: Whiting  
Location: Whiting, IN  
Representing: TRC Environmental

Type: <u>NOX Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		<u>4-6 ppm</u>	<u>10-12 ppm</u>
Cylinder ID Number:		<u>CC177329</u>	<u>EB0000706</u>
Certification Expiration Date:		<u>7-May-15</u>	<u>26-Feb-15</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>4.97</u>	<u>11.08</u>
CEMS Response 1:		<u>4.8</u>	<u>11.1</u>
CEMS Response 2:		<u>4.8</u>	<u>11.0</u>
CEMS Response 3:		<u>4.8</u>	<u>10.9</u>
Average CEMS Response:		<u>4.8</u>	<u>11.0</u>
Accuracy:		<u>-3.42%</u>	<u>-0.72%</u>
Absolute Difference:		<u>0.2</u>	<u>0.1</u>

Type: <u>CO Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		<u>4-6 ppm</u>	<u>10-12 ppm</u>
Cylinder ID Number:		<u>CC177329</u>	<u>EB0000706</u>
Certification Expiration Date:		<u>7-May-15</u>	<u>26-Feb-15</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>5.0</u>	<u>10.99</u>
CEMS Response 1:		<u>5.1</u>	<u>11.2</u>
CEMS Response 2:		<u>5.0</u>	<u>11.2</u>
CEMS Response 3:		<u>5.1</u>	<u>11.2</u>
Average CEMS Response:		<u>5.1</u>	<u>11.2</u>
Accuracy:		<u>1.33%</u>	<u>1.91%</u>
Absolute Difference:		<u>0.1</u>	<u>0.2</u>

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is  $\pm 15$  percent of the average audit value, or the absolute difference is  $\pm 5$  ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Third Quarter  
Client: Praxair  
Unit: SMR 5 - HU1 Stack  
Project Number: 202965.1000.0000  
Auditor: David McNulty

Date of Audit: September 18, 2013  
Plant Name: Whiting  
Location: Whiting, IN  
Representing: TRC Environmental

Type: <u>NO<sub>x</sub> High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>200 ppm</u>		
** Audit Range (ppm or %):		<u>40-60</u>	<u>100-120</u>
Cylinder ID Number:		<u>SX47405</u>	<u>SX48605</u>
Certification Expiration Date:		<u>19-Feb-15</u>	<u>15-Feb-19</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>49.53</u>	<u>110.18</u>
CEMS Response 1:		<u>48.9</u>	<u>105.3</u>
CEMS Response 2:		<u>47.8</u>	<u>106.3</u>
CEMS Response 3:		<u>47.8</u>	<u>106.4</u>
Average CEMS Response:		<u>48.2</u>	<u>106.0</u>
Accuracy:		<u>-2.75%</u>	<u>-3.79%</u>
Absolute Difference:		<u>1.4</u>	<u>4.2</u>

Type: <u>CO High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>100 ppm</u>		
** Audit Range (ppm or %):		<u>20-30</u>	<u>50-60</u>
Cylinder ID Number:		<u>SX47405</u>	<u>SX48605</u>
Certification Expiration Date:		<u>19-Feb-15</u>	<u>15-Feb-19</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>25.35</u>	<u>55.11</u>
CEMS Response 1:		<u>25.9</u>	<u>55.8</u>
CEMS Response 2:		<u>26.0</u>	<u>56.4</u>
CEMS Response 3:		<u>26.0</u>	<u>56.2</u>
Average CEMS Response:		<u>26.0</u>	<u>56.1</u>
Accuracy:		<u>2.43%</u>	<u>1.86%</u>
Absolute Difference:		<u>0.6</u>	<u>1.0</u>

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is  $\pm 15$  percent of the average audit value, or the absolute difference is  $\pm 5$  ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1      20-30% of Full Scale  
Audit Point 2      50-60% of Full Scale

O<sub>2</sub>

Audit Point 1      4-6%  
Audit Point 2      8-12%

CO<sub>2</sub>

Audit Point 1      5-8%  
Audit Point 2      10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Third Quarter  
Client: Praxair  
Unit: SMR 5 - HU1 Stack  
Project Number: 202965.1000.0000  
Auditor: David McNulty

Date of Audit: September 18, 2013  
Plant Name: Whiting  
Location: Whiting, IN  
Representing: TRC Environmental

Type: <u>O<sub>2</sub></u>	Manufacturer: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>25%</u>		
** Audit Range (ppm or %):		<u>4-6%</u>	<u>8-12%</u>
Cylinder ID Number:		<u>FL-0000282</u>	<u>EB0031709</u>
Certification Expiration Date:		<u>6-Feb-15</u>	<u>25-Oct-20</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>5.13</u>	<u>9.85</u>
CEMS Response 1:		<u>4.9</u>	<u>9.9</u>
CEMS Response 2:		<u>5.1</u>	<u>10.0</u>
CEMS Response 3:		<u>4.6</u>	<u>10.0</u>
Average CEMS Response:		<u>4.9</u>	<u>10.0</u>
Accuracy:		<u>-5.13%</u>	<u>1.18%</u>
Absolute Difference:		<u>0.3</u>	<u>0.1</u>

### Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

### Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

### Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

### \*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Third Quarter  
Client: Praxair  
Unit: SMR 6 - HU2 Stack  
Project Number: 202965.1000.0000  
Auditor: David McNulty

Date of Audit: September 18, 2013  
Plant Name: Whiting  
Location: Whiting, IN  
Representing: TRC Environmental

Type: <u>NOX Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		<u>4-6 ppm</u>	<u>10-12 ppm</u>
Cylinder ID Number:		<u>CC177329</u>	<u>EB0000706</u>
Certification Expiration Date:		<u>7-May-15</u>	<u>26-Feb-15</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>4.97</u>	<u>11.08</u>
CEMS Response 1:		<u>5.1</u>	<u>11.3</u>
CEMS Response 2:		<u>4.9</u>	<u>11.0</u>
CEMS Response 3:		<u>4.8</u>	<u>11.0</u>
Average CEMS Response:		<u>4.9</u>	<u>11.1</u>
Accuracy:		<u>-0.74%</u>	<u>0.18%</u>
Absolute Difference:		<u>0.0</u>	<u>0.0</u>

Type: <u>CO Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		<u>4-8 ppm</u>	<u>10-12 ppm</u>
Cylinder ID Number:		<u>CC177329</u>	<u>EB0000706</u>
Certification Expiration Date:		<u>7-May-15</u>	<u>26-Feb-15</u>
Certification Type:		<u>Protocol 1</u>	<u>Protocol 1</u>
Certified Value		<u>5.0</u>	<u>10.99</u>
CEMS Response 1:		<u>5.0</u>	<u>11.1</u>
CEMS Response 2:		<u>4.9</u>	<u>11.1</u>
CEMS Response 3:		<u>4.9</u>	<u>11.0</u>
Average CEMS Response:		<u>4.9</u>	<u>11.1</u>
Accuracy:		<u>-1.33%</u>	<u>0.70%</u>
Absolute Difference:		<u>0.1</u>	<u>0.1</u>

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is  $\pm 15$  percent of the average audit value, or the absolute difference is  $\pm 5$  ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 18, 2013
Client:	Praxair	Plant Name:	Whiting
Unit:	SMR 6 - HU2 Stack	Location:	Whiting, IN
Project Number:	202965.1000.0000	Representing:	TRC Environmental
Auditor:	David McNulty		

Type: <u>NO<sub>x</sub> High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>200 ppm</u>		
** Audit Range (ppm or %):		40-80	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date:		19-Feb-15	15-Feb-19
Certification Type:		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		46.8	106.1
CEMS Response 2:		47.1	105.6
CEMS Response 3:		47.1	105.3
Average CEMS Response:		47.0	106.7
Accuracy:		-5.11%	-4.10%
Absolute Difference:		2.5	4.5

Type: <u>CO High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>100 ppm</u>		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date:		19-Feb-15	15-Feb-19
Certification Type:		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.8	55.6
CEMS Response 2:		25.9	55.8
CEMS Response 3:		25.9	55.9
Average CEMS Response:		25.9	55.8
Accuracy:		2.04%	1.19%
Absolute Difference:		0.5	0.7

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

\*\* Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Third Quarter  
Client: Praxair  
Unit: SMR 6 - HU2 Stack  
Project Number: 202965.1000.0000  
Auditor: David McNulty

Date of Audit: September 18, 2013  
Plant Name: Whiting  
Location: Whiting, IN  
Representing: TRC Environmental

Type: <u>O<sub>2</sub></u>	Manufacturer: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>25%</u>		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0031709
Certification Expiration Date:		6-Feb-15	25-Oct-20
Certification Type:		Protocol 1	Protocol 1
Certified Value		5.13	9.85
CEMS Response 1:		5.0	9.9
CEMS Response 2:		5.0	9.8
CEMS Response 3:		5.0	9.9
Average CEMS Response:		5.0	9.9
Accuracy:		-2.53%	0.17%
Absolute Difference:		0.1	0.0

### Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

### Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

### Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

### \*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 18, 2013
Client:	Praxair	Plant Name:	Whiting
Unit:	HU Flare Stack	Location:	Whiting, IN
Project Number:	202985.1000.0000	Representing:	TRC Environmental
Auditor:	David McNulty		

Type:	SO <sub>2</sub>	Manufacturer:	Thermal Environmental	Audit Point 1	Audit Point 2
Model:	SOLA II	Serial Number:	SL-06230909		
		Full Scale Value:	350 ppm		
** Audit Range (ppm or %):				70-105	175-210
Cylinder ID Number:				CC-97333	XC-019328B
Certification Expiration Date:				24-May-14	25-May-14
Certification Type:				Protocol 1	Protocol 1
Certified Value				92.4	204.3
CEMS Response 1:				92.1	204.5
CEMS Response 2:				92.5	205.0
CEMS Response 3:				93.2	204.5
Average CEMS Response:				92.6	204.7
Accuracy:				0.22%	0.18%
Absolute Difference:				0.2	0.4

### Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

### Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

### Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

### \*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

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## **Appendix B: Computer Data**

## ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: Praxair  
LOCATION: Whiting, IN  
SOURCE: HU Flare  
CEMS ID NO.: SL-06230909  
DATE CREATED: 09/18/2013 @ 15:00  
PERIOD: 09/18/2013 @ 14:20 - 09/18/2013 @ 14:58

## ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	SO2 (PPM)
09/18/13 14:20	84.6
09/18/13 14:21	90.2
09/18/13 14:22	91.4
09/18/13 14:23	92.1
09/18/13 14:24	95.2
09/18/13 14:25	106.1
09/18/13 14:26	156.4
09/18/13 14:27	197.4
09/18/13 14:28	204.0
09/18/13 14:29	204.5
09/18/13 14:30	204.3
09/18/13 14:31	193.1
09/18/13 14:32	142.3
09/18/13 14:33	98.3
09/18/13 14:34	93.9
09/18/13 14:35	93.0
09/18/13 14:36	92.7
09/18/13 14:37	92.5
09/18/13 14:38	92.8
09/18/13 14:39	104.9
09/18/13 14:40	150.4
09/18/13 14:41	197.1
09/18/13 14:42	204.0
09/18/13 14:43	205.0
09/18/13 14:44	205.0
09/18/13 14:45	199.2
09/18/13 14:46	172.1
09/18/13 14:47	123.2
09/18/13 14:48	97.3
09/18/13 14:49	93.4
09/18/13 14:50	92.9
09/18/13 14:51	93.2
09/18/13 14:52	92.5
09/18/13 14:53	101.6
09/18/13 14:54	152.5
09/18/13 14:55	197.9
09/18/13 14:56	204.0
09/18/13 14:57	204.5
09/18/13 14:58	205.0

## REPORT SUMMARY

	SO2 (PPM)
AVG:	0.0

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

# ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: Praxair  
 LOCATION: ~~Waiting IN~~  
 SOURCE: SM65-HUI  
 CEMS ID NO.: P-377D  
 DATE CREATED: 09/18/2013 @ 11:12  
 PERIOD: 09/18/2013 @ 10:45 - 09/18/2013 @ 11:12

## ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	NOX-L (PPM) -MC	CO-L (PPM) -MC
09/18/13	10:45		6.2-00	5.2-00
09/18/13	10:46		5.0-00	5.1-00
09/18/13	10:47		4.9-00	5.1-00
09/18/13	10:48		4.8-00	5.1-00
09/18/13	10:49		4.8-00	4.8-00
09/18/13	10:50		7.0-00	6.6-00
09/18/13	10:51		11.4-00	11.2-00
09/18/13	10:52		11.1-00	11.2-00
09/18/13	10:53		10.8-00	10.2-00
09/18/13	10:54		6.0-00	5.4-00
09/18/13	10:55		4.8-00	5.0-00
09/18/13	10:56		4.8-00	5.0-00
09/18/13	10:57		4.8-00	5.0-00
09/18/13	10:58		7.7-00	9.2-00
09/18/13	10:59		15.0-00	11.2-00
09/18/13	11:00		11.0-00	11.2-00
09/18/13	11:01		10.9-00	11.1-00
09/18/13	11:02		9.9-00	9.0-00
09/18/13	11:03		5.0-00	5.0-00
09/18/13	11:04		4.8-00	5.0-00
09/18/13	11:05		4.8-00	5.0-00
09/18/13	11:06		4.8-00	5.1-00
09/18/13	11:07		7.8-00	9.4-00
09/18/13	11:08		10.9-00	11.2-00
09/18/13	11:09		10.9-00	11.2-00
09/18/13	11:10		10.9-00	11.2-00
09/18/13	11:11		10.9-00	11.2-00
09/18/13	11:12		MISS	

## REPORT SUMMARY

	NOX-L (PPM)	CO-L (PPM)
AVG:	7.7	7.8
TOTAL:	2.077E2	2.104E2

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
 LOCATION: Whit100, IN  
 SOURCE: SMR3-HU1  
 CEMS ID NO.: 15-3770  
 DATE CREATED: 09/18/2013 @ 10:15  
 PERIOD: 09/18/2013 @ 09:45 - 09/18/2013 @ 10:14

ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:mm	NOX (PPM)	CO (PPM)
09/18/13	09:45		57.7	45.7
09/18/13	09:46		103.6	55.3
09/18/13	09:47		105.3	55.8
09/18/13	09:48		106.0	56.1
09/18/13	09:49		46.0	36.3
09/18/13	09:50		59.0	46.6
09/18/13	09:51		106.2	56.2
09/18/13	09:52		107.0	44.8
09/18/13	09:53		92.1	98.7
09/18/13	09:54		49.8	25.9
09/18/13	09:55		48.9	25.9
09/18/13	09:56		48.4	26.0
09/18/13	09:57		56.0	38.8
09/18/13	09:58		105.8	56.4
09/18/13	09:59		106.2	56.4
09/18/13	10:00		106.3	56.4
09/18/13	10:01		106.3	56.3
09/18/13	10:02		96.8	35.9
09/18/13	10:03		41.6	26.4
09/18/13	10:04		47.7	25.9
09/18/13	10:05		47.8	26.0
09/18/13	10:06		47.6	26.0
09/18/13	10:07		101.0	56.2
09/18/13	10:08		106.2	56.3
09/18/13	10:09		106.4	56.2
09/18/13	10:10		106.4	56.2
09/18/13	10:11		49.8	26.1
09/18/13	10:12		47.8	26.0
09/18/13	10:13		47.5	26.0
09/18/13	10:14		47.6	26.0

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
 LOCATION: Whiting, IN  
 SOURCE: SMR5-HUI  
 CEMS ID NO.: 3770  
 DATE CREATED: 09/18/2013 @ 09:43  
 PERIOD: 09/18/2013 @ 09:15 - 09/18/2013 @ 09:42

ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	O2 (%)
09/18/13	09:15		-0.4
09/18/13	09:16		4.4
09/18/13	09:17		4.6
09/18/13	09:18		4.9
09/18/13	09:19		3.2
09/18/13	09:20		3.8
09/18/13	09:21		19.1
09/18/13	09:22		10.3
09/18/13	09:23		10.2
09/18/13	09:24		9.9
09/18/13	09:25		5.8
09/18/13	09:26		4.7
09/18/13	09:27		5.2
09/18/13	09:28		5.1
09/18/13	09:29		4.8
09/18/13	09:30		9.9
09/18/13	09:31		9.7
09/18/13	09:32		10.0
09/18/13	09:33		9.6
09/18/13	09:34		6.5
09/18/13	09:35		4.6
09/18/13	09:36		4.6
09/18/13	09:37		7.7
09/18/13	09:38		9.9
09/18/13	09:39		9.6
09/18/13	09:40		10.0
09/18/13	09:41		9.7
09/18/13	09:42		6.5

# ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: Praxair  
 LOCATION: WASHINGTON, IN  
 SOURCE: SMR6-HU2  
 CEMS ID NO.: P-3772  
 DATE CREATED: 09/18/2013 @ 13:40  
 PERIOD: 09/18/2013 @ 13:10 - 09/18/2013 @ 13:38

## ONE MINUTE SUMMARY

DATE	MM/DD/YY HH:MM	NOX-L (PPM)	CO-L (PPM)
09/18/13	13:10	5.2	3.6
09/18/13	13:11	5.8	5.5
09/18/13	13:12	6.0	11.4
09/18/13	13:13	8.1	7.0
09/18/13	13:14	5.5	5.1
09/18/13	13:15	5.1	5.0
09/18/13	13:16	3.4	7.1
09/18/13	13:17	8.3	9.7
09/18/13	13:18	6.1	9.8
09/18/13	13:19	13.8	11.8
09/18/13	13:20	11.9	11.3
09/18/13	13:21	11.5	11.2
09/18/13	13:22	11.3	11.1
09/18/13	13:23	10.2	9.0
09/18/13	13:24	5.3	5.0
09/18/13	13:25	4.9	4.9
09/18/13	13:26	4.9	4.9
09/18/13	13:27	4.9	5.3
09/18/13	13:28	9.4	10.3
09/18/13	13:29	11.0	11.1
09/18/13	13:30	11.1	11.0
09/18/13	13:31	9.7	8.5
09/18/13	13:32	5.1	4.9
09/18/13	13:33	4.8	4.9
09/18/13	13:34	4.8	4.9
09/18/13	13:35	6.1	7.3
09/18/13	13:36	10.8	11.0
09/18/13	13:37	11.0	11.0
09/18/13	13:38	11.0	11.0

## REPORT SUMMARY

NOX-L (PPM)	CO-L (PPM)
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NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
 LOCATION: WHEELING, IN  
 SOURCE: SMRG-HUZ  
 CENS ID NO.: P-3771  
 DATE CREATED: 09/18/2013 @ 12:42  
 PERIOD: 09/18/2013 @ 12:15 - 09/18/2013 @ 12:40

ONE MINUTE SUMMARY

DATE	NM/DD/YY HH:MM	NOX (PPM)	CO (PPM)
09/18/13 12:15		1.6	6.2
09/18/13 12:16		35.3	24.9
09/18/13 12:17		46.2	25.8
09/18/13 12:18		46.5	25.8
09/18/13 12:19		46.8	25.8
09/18/13 12:20		46.7	25.8
09/18/13 12:21		88.5	27.3
09/18/13 12:22		106.7	54.9
09/18/13 12:23		106.1	55.6
09/18/13 12:24		105.8	55.7
09/18/13 12:25		100.8	45.1
09/18/13 12:26		47.4	25.9
09/18/13 12:27		47.1	25.9
09/18/13 12:28		47.1	25.9
09/18/13 12:29		82.5	52.3
09/18/13 12:30		105.6	55.8
09/18/13 12:31		105.6	55.8
09/18/13 12:32		105.5	52.2
09/18/13 12:33		47.9	25.9
09/18/13 12:34		47.1	25.9
09/18/13 12:35		47.0	25.8
09/18/13 12:36		49.0	34.0
09/18/13 12:37		104.9	55.8
09/18/13 12:38		105.3	55.9
09/18/13 12:39		105.2	55.8
09/18/13 12:40		105.3	55.9

REPORT SUMMARY

NOX  
(PPM)

CO  
(PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
 LOCATION: ~~WARRINGTON~~ IN  
 SOURCE: SMR6-HU2  
 CENS ID NO.: P-3771  
 DATE CREATED: 09/18/2013 @ 12:15  
 PERIOD: 09/18/2013 @ 11:49 - 09/18/2013 @ 12:14

ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	O2 (%)
09/18/13	11:49		3.3
09/18/13	11:50		4.9
09/18/13	11:51		5.0
09/18/13	11:52		5.0
09/18/13	11:53		6.5
09/18/13	11:54		11.0
09/18/13	11:55		10.0
09/18/13	11:56		9.8
09/18/13	11:57		9.9
09/18/13	11:58		9.9
09/18/13	11:59		5.1
09/18/13	12:00		5.0
09/18/13	12:01		5.0
09/18/13	12:02		5.7
09/18/13	12:03		9.9
09/18/13	12:04		9.8
09/18/13	12:05		9.8
09/18/13	12:06		9.2
09/18/13	12:07		5.0
09/18/13	12:08		5.0
09/18/13	12:09		5.0
09/18/13	12:10		4.9
09/18/13	12:11		8.8
09/18/13	12:12		8.9
09/18/13	12:13		9.9
09/18/13	12:14		9.9

REPORT SUMMARY

O2 (%)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

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## **Appendix C: Audit Gas Certification Sheets**



1700 Scepter Rd  
Waverly, TN 37185  
931-296-3357

### Certificate of Analysis - EPA Protocol Mixtures

Customer: TRC ENVIRONMENTAL CORP.  
7521 BRUSH HILL RD  
BURR RIDGE, IL 60527

Customer PO#: GEE292

Cylinder Number: CC177329  
Cylinder Pressure: 1900psig  
Last Analysis Date: 5/7/2013  
Expiration Date: 5/7/2015

Protocol: G1      Reference #: 626623-01      Lot#: 9303605309



#### REPLICATE RESPONSES

Component: Carbon Monoxide  
Certified Conc: 5.00ppm    +/- 0.54%    REL

Date: 5/7/2013  
5.01  
5.00  
5.00

Component: Nitric Oxide  
Certified Conc: 4.97ppm    +/- 1.25%    REL

Date: 4/29/2013      Date: 5/6/2013  
4.96                      4.95  
4.97                      4.98  
4.98                      4.97

NOx: 5.5ppm      Reference Only

BALANCE GAS: Nitrogen

#### REFERENCE STANDARDS:

Component: Carbon Monoxide  
Reference Standard: GMIS  
Cylinder #: ND22576  
Concentration: 9.34ppm  
Exp. Date: 7/10/2014

Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: AN11101  
Concentration: 18.98ppm  
Exp. Date: 6/17/2017

#### CERTIFICATION INSTRUMENTS

Component: Carbon Monoxide  
Make/Model: Thermo 48I-TLE  
Serial Number: 903034427  
Measurement Principle: NDIR  
Last Calibration: 5/7/2013

Component: Nitric Oxide  
Make/Model: Horiba CLA-5108  
Serial Number: FRJ8FDME  
Measurement Principle: Chemi  
Last Calibration: 4/11/2013

Notes: Carbon Monoxide GMIS CERTIFIED USING SRM STANDARD.  
CYLINDER# FF30774

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.  
U.S. EPA Vendor ID No.: D62013    PGVP Participation Date: 01/01/13:    PGVP Renewal Date: 12/31/13

Analyst:

Julie Higgins

Date: 5/8/2013

**MATHESON**

ask...The Gas Professionals™

1700 Scepter Rd  
Waverly, TN 37185  
931-298-3367**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE Energy Management SVCS Inc

Customer PO#:

Cylinder Number:	EB0000706	Protocol:	Reference #:	Lot#:
Cylinder Pressure:	1900 psig	G1	T180909-5	9303804675
Last Analysis Date:	2/26/2013	<div>DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 1000 PSIG</div>		
Expiration Date:	2/26/2015			

**REPLICATE RESPONSES**

Component: Carbon Monoxide  
Certified Conc: 10.99 ppm +/- 1% REL

Date: 2/12/2013

10.97

11.03

10.92

Component: Nitric Oxide  
Certified Conc: 11.08 ppm +/- 1% REL

Date: 2/19/2013

Date: 2/26/2013

11.18

11.11

11.19

10.99

11.02

10.96

NOx: 11.79 ppm Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component: Carbon Monoxide  
Reference Standard: SRM  
Cylinder #: CAL017991  
Concentration: 98.85 ppm  
Exp. Date: 1/2/2017

Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: ND43268  
Concentration: 98.17 ppm  
Exp. Date: 9/20/2015

**CERTIFICATION INSTRUMENTS**

Component: Carbon Monoxide  
Make/Model: Horiba VIA-510  
Serial Number: RL77Y00G  
Measurement Principle: NDIR  
Last Calibration: 1/23/2013

Component: Nitric Oxide  
Make/Model: Antaris IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 2/7/2013

**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document. U.S. EPA Vendor ID No.: D82013 PGVP Participation Date: 01/01/13; PGVP Renewal Date: 12/31/13

Analyst:

Roman Khidekel

Date: 2/27/2013

**MATHESON**

ask...The Gas Professionals™

1700 Scepter Rd  
Waverly, TN 37185  
931-296-3357**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE ENERGY MANAGEMENT SVCS INC.

Customer PO#:

Cylinder Number:	SX47405	Protocol:	Reference #:	Lot#:
Cylinder Pressure:	1900 PSIG	G1	622600	9303604676

Last Analysis Date: 2/19/2013

Expiration Date: 2/19/2015

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS  
BELOW 100 PSIG

Component: Carbon Monoxide  
Certified Conc: 25.35 PPM +/- 1% REL

Date: 2/12/2013  
25.34  
25.34  
25.37

Component: Nitric Oxide  
Certified Conc: 49.53 PPM +/- 1% REL

Date:	2/12/2013	Date:	2/19/2013
	49.41		49.72
	49.42		49.57
	49.42		49.53

NOx: 50.47 PPM Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component: Carbon Monoxide  
Reference Standard: GMIS  
Cylinder #: SX51243  
Concentration: 207.73 PPM  
Exp. Date: 10/10/2014

Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: ND43269  
Concentration: 98.17 PPM  
Exp. Date: 9/20/2015

**CERTIFICATION INSTRUMENTS**

Component: Carbon Monoxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 1/14/2013

Component: Nitric Oxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 2/7/2013

**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.  
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13; PGVP Renewal Date: 12/31/13

Analyst:

*Saylor Wallace*

Date: 2/19/2013


**MATHESON**

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1700 Scepter Rd  
Waverly, TN 37185  
931-298-3367**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE ENERGY MANAGEMENT SERVICES INC

Customer PO#:

Cylinder Number:	SX48605	Protocol:	Reference #:	Lot#:
Cylinder Pressure:	1900 PSIG	G1	622800	8303604677
Last Analysis Date:	2/19/2013			
Expiration Date:	2/19/2015			

Component: Carbon Monoxide  
Certified Conc: 55.11 PPM +/- 1% REL

REPLICATE RESPONSES  
Date: 2/12/2013  
55.06  
55.09  
55.19

Component: Nitric Oxide  
Certified Conc: 110.18 PPM +/- 1% REL

Date:	2/12/2013	Date:	2/18/2013
	110.19		110.64
	109.59		110.20
	110.35		110.13

NOx: 111.48 PPM Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component: Carbon Monoxide  
Reference Standard: GMIS  
Cylinder #: SX51243  
Concentration: 207.79%  
Exp. Date: 10/10/2014

Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: ND43269  
Concentration: 98.17PPM  
Exp. Date: 9/20/2015

**CERTIFICATION INSTRUMENTS**

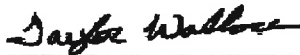
Component: Carbon Monoxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 1/14/2013

Component: Nitric Oxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 2/7/2013

**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document. U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst:



Date: 2/19/2013



**MATHESON  
TRI-GAS**

ask. . The Gas Professionals™ **Certificate of Analysis - EPA Protocol Mixtures**

1650 Enterprise Parkway  
Twinsburg, Ohio 44087  
215-646-4000

Customer: GE ENERGY MANAGEMENT SVCS INC.  
Cylinder Number: FL-0000282  
Cylinder pressure: 2000 psig  
Last Analysis date: 2/6/2012  
Expiration Date: 2/6/15

Protocol: Reference # Lot #  
G1 592081 109-26-07001

**DO NOT USE THIS CYLINDER WHEN THE  
PRESSURE FALLS BELOW 150 PSIG**

**REPLICATE RESPONSES**

Component: Oxygen  
Certified Conc: 5.13% ± 1% REL

Date: 2/6/2012 Date:  
5.13%  
5.13%  
5.13%

**BALANCE GAS:** Nitrogen

**REFERENCE STANDARDS**

Component: Oxygen  
SRM #: SRM-2658a  
Sample #: 72-D-40  
Cylinder #: CAL-016840  
Concentration: 9.918%

**CERTIFICATION INSTRUMENTS**

Component: Oxygen  
Make/Model: Rosemount 755  
Serial Number: 2002832  
Measurement Principle: Paramagnetic  
Last Calibration: 1/27/2012

Notes: T168024

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/01/13

Analyst

*Philip D. Mont*

Date 2/7/2012

**MATHESON**

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1700 Scepter Rd  
Waverly, TN 37185  
931-296-3357**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE STOCK

Cylinder Number: EB0031709  
Cylinder Pressure: 1900psig  
Last Analysis Date: 10/25/2012  
Expiration Date: 10/25/2020

Protocol: G1      Reference #: T179174-1      Lot#: 9302604220

**REPLICATE RESPONSES**

Date: 10/25/2012

Component: Oxygen

9.85

Certified Conc: 9.85% +/- 1% REL

9.85

9.86

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component: Oxygen

Reference Standard: SRM

Cylinder #: CAL015431

Concentration: 20.72%

Exp. Date: 1/1/2016

**CERTIFICATION INSTRUMENTS**

Component: Oxygen

Make/Model: Horiba MPA-510

Serial Number: PGDF4TKM

Measurement Principle: Paramagnetic

Last Calibration: 10/8/2012

**Notes:** Acid rain CEM Meets Federal Register Specification Title 40 CFR 72.2  
Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm Carbon  
Monoxide <0.5ppm Sulfur Dioxide <0.1ppm THC <0.1ppm Water <1.0ppm

This Certification was performed according to EPA Traceability Protocol for Assay &amp; Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure is assigned using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D52012 PGVP Participation Date: 01/01/12 PGVP Renewal Date: 12/31/12

Analyst:

La'Shawn Grissom

Date: 1/9/2013



# MATHESON TRI-GAS

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## Certificate of Analysis - EPA Protocol Mixtures

1450 Enterprise Parkway  
Twinsburg, Ohio 44087  
215-448-4000

Customer: GE ENERGY  
Cylinder Number: GC-87333  
Cylinder pressure: 2000 psig  
Last Analysis date: 5/25/2012  
Expiration Date: 5/25/14

Protocol: Reference # Lot #  
G1 601119 109-96-27812



### REPLICATE RESPONSES

Component : Sulfur Dioxide  
Certified Conc: 92.4 ppm  $\pm$  1% rel

Date:	5/18/2012	Date:	5/25/2012
	92.2 PPM		92.1 PPM
	92.5 PPM		92.4 PPM
	92.4 PPM		92.7 PPM

BALANCE GAS: Nitrogen

### REFERENCE STANDARDS

Component: Sulfur Dioxide  
SRM #: SRM-1694a  
Sample #: 95-J-40  
Cylinder #: CAL-016664  
Concentration: 98.57 ppm

### CERTIFICATION INSTRUMENTS

Component: Sulfur Dioxide  
Make/Model: Nicolet 550  
Serial Number: ACN-8402192  
Measurement Principle: FTIR  
Last Calibration: 5/3/2012

Notes: T171484

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/31/13

Analyst

Date 5/25/2012



**MATHESON  
TRI-GAS**

ask...The Gas Professionals™

**Certificate of Analysis - EPA Protocol Mixtures**

1650 Enterprise Parkway  
Twinsburg, Ohio 44087  
215-446-4000

Customer: GE ENERGY  
Cylinder Number: XC-019382B  
Cylinder pressure: 2000 psig  
Last Analysis date: 5/24/2012  
Expiration Date: 5/24/14

Protocol: Reference # Lot #  
G1 601119 109-96-27813



**REPLICATE RESPONSES**

Component: Sulfur Dioxide  
Certified Conc: 204.3 ppm  $\pm$  1% rel

Date: 5/17/2012	Date: 5/24/2012
203.6 PPM	204.5 PPM
203.5 PPM	204.6 PPM
205.1 PPM	204.5 PPM

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS**

Component: Sulfur Dioxide  
SRM #: SRM-1661a  
Sample #: 94-H-12  
Cylinder #: FF-27996  
Concentration: 490.9 ppm

**CERTIFICATION INSTRUMENTS**

Component: Sulfur Dioxide  
Make/Model: Nicolet 550  
Serial Number: ACN-9402192  
Measurement Principle: FTIR  
Last Calibration: 5/3/2012

Notes: T171484

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/01/13

Analyst         *SL*         Date         5/25/2012

**Appendix 2b – 4<sup>th</sup> Quarter 2013 CEM Summary Performance  
Report**



BP Products North America Inc.  
2815 Indianapolis Blvd.  
P O Box 710  
Whiting, IN 46394-0710  
USA

January 27, 2014

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

Mr. Dave Cline  
Section Chief  
Indiana Department of Environmental Management  
Compliance Data Section, Office of Air Quality  
100 North Senate Avenue  
MC 61-53 IGCN 1003  
Indianapolis, IN 46204-2251

Dear Mr. Cline:

Re: CEM Summary Performance Report – Fourth Quarter 2013  
BP Products North America Inc. - Whiting Business Unit  
Part 70 Operating Permit No. T089-6741-00453 for SPM No. 089-32755-00453

Attached please find the Continuous Emission Monitor (CEM) summary performance reports for the BP Products North America Inc. - Whiting Business Unit (BP Whiting) for the units listed below. This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453, for Significant Permit Modification (SPM) No. 089-32755-00453, issued on April 23, 2013, and fulfills the reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). BP Whiting has chosen to also include the NO<sub>x</sub> CEMS Summary Performance Report for the No. 3 Stanolind Power Station (3SPS), which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. This report is for the period beginning on October 1, 2013 through December 31, 2013. See Table 1 for a complete list of permitted emissions units and relevant pollutants monitored by CEMS.

As part of Permit Condition C.12 of SPM 089-32755-00453 and 40 CFR 60.108a(d)(5) and (6), information required for downtime and excess emissions are included as follows. Only the Catalytic Refining Unit (CRU) Hydrogen Sulfide (H<sub>2</sub>S) CEMS operated with downtime totaling greater than 5% of the total operating time for the quarter. All other units operated with downtime less than 5% of the total operating time for the quarter. Nevertheless, it should be noted that downtime occurred at the Cat Feed Hydrotreater Unit (CFHU) H<sub>2</sub>S, CRU H<sub>2</sub>S, No. 4 Ultraformer (4UF) H<sub>2</sub>S and Total Sulfur (TS), Distillate Desulfurizer Unit (DDU) Flare H<sub>2</sub>S, No. 2 Coker Heaters F-202 and F-203 Nitrogen Oxides (NO<sub>x</sub>) and Carbon Monoxide (CO), No. 12 Pipestill (12PS) Heater H-102 NO<sub>x</sub> and CO, Distillate Hydrotreater Unit (DHT) NO<sub>x</sub> and CO, GOHT Flare H<sub>2</sub>S, South Flare H<sub>2</sub>S, SRU No. 1 Claus Off-Gas Treatment (COT1) Tail Gas Unit (TGU) and COT2 TGU CO and SO<sub>2</sub>, 500 Fluid Catalytic Cracking Unit (FCU 500) NO<sub>x</sub>, CO, and SO<sub>2</sub>, FCU 600 NO<sub>x</sub>, CO, and SO<sub>2</sub>, No. 3 Stanolind Power Station (3SPS) Boilers 31, 32, 33, and 34 NO<sub>x</sub> and CO, and 3SPS Boiler 36 NO<sub>x</sub> CEMS as follows.

January 27, 2014

Page -2-

- On December 9, 2013, the CFHU H<sub>2</sub>S CEMS experienced three (3) hours of downtime as a result of preventive maintenance. On December 15, 2013, the CEMS experienced three (3) hours of downtime as a result of the quarterly Cylinder Gas Audit. On December 17, 2013, the CEMS experienced one (1) hour of downtime as a result of an analyzer malfunction. A review of process parameters before, during, and after the events, demonstrates that emissions units associated with the CFHU H<sub>2</sub>S CEMS did not exceed any emissions limits during the downtime periods.
- On November 19, 2013, through December 5, 2013, the CRU H<sub>2</sub>S CEMS experienced three hundred sixty-nine (369) hours of downtime as a result of mistakenly halting the daily calibrations during this period as it was thought the stream being monitored was not in operation. A review of process parameters before, during, and after the event, demonstrates that emissions units associated with the CRU H<sub>2</sub>S CEMS did not exceed any emissions limits during the downtime periods.
- On December 5, 2013, the 4UF H<sub>2</sub>S and TS CEMS experienced one (1) hour each of downtime as a result of a communication fault. On December 19, 2013, the H<sub>2</sub>S CEMS experienced one (1) hour of downtime as a result of the quarterly Cylinder Gas Audit. On December 24, 2013, the H<sub>2</sub>S CEMS experienced two (2) hours of downtime as a result of an NAU malfunction. A review of process parameters before, during, and after the event, demonstrates that emissions units associated with the 4UF H<sub>2</sub>S and TS CEMS did not exceed any emissions limits during the downtime periods.
- On October 30, 2013, November 1, 2013, and December 4, 2013, the DDU Flare H<sub>2</sub>S CEMS experienced several downtime periods totaling six (6) hours of downtime as a result of preventive maintenance conducted on the CEMS.
- On December 16, 2013, and December 17, 2013, the F-202 NO<sub>x</sub> CEMS experienced a total of thirteen (13) hours of downtime as a result of the quarterly Cylinder Gas Audit. On December 17, 2013, the CO CEMS experienced one (1) hour of downtime as a result of the quarterly Cylinder Gas Audit. A review of process parameters before, during, and after the event, demonstrates that the No. 2 Coker F-202 did not exceed any emissions limits during the downtime periods.
- On November 12, 2013, the F-203 NO<sub>x</sub> and CO CEMS experienced nine (9) hours of downtime as a result of system testing during startup of the unit. A review of process parameters before, during, and after the event, demonstrates that the No. 2 Coker F-203 did not exceed any emissions limits during the downtime periods.
- On November 12, 2013, the 12PS Heaters H-102 NO<sub>x</sub> and CO CEMS experienced one (1) hour of downtime each as a result of a probe heater malfunction. A review of process parameters before, during, and after the event, demonstrates that the 12PS H-102 did not exceed any emissions limits during the downtime periods.
- On December 6, 2013, the DHT NO<sub>x</sub> and CO CEMS experienced one (1) hour each of downtime as a result of a power outage.

January 27, 2014

Page -3-

- On July 31, 2013, the GOHT Flare H<sub>2</sub>S CEMS experienced three (3) hours of downtime as a result of an analyzer malfunction. On November 21, 2013, the CEMS experienced one (1) hour of downtime as a result of a process upset. The flare gas recovery unit was operating and, as such, there were no excess emissions during the first downtime period.
- On November 18, 2013, and November 24, 2013, the South Flare H<sub>2</sub>S CEMS experienced two (2) downtime periods totaling twenty-nine (29) hours as a result of a process upset. On December 31, 2013, the CEMS experienced three (3) hours of downtime as a result of the quarterly Cylinder Gas Audit. The flare gas recovery unit was operating and, as such, there were no excess emissions during the last downtime period.
- From October 9, 2013, through November 13, 2013, the SRC COT1 TGU SO<sub>2</sub> and CO CEMS experienced several episodes of downtime totaling thirty-four (34) hours as a result of equipment malfunctions and preventive maintenance. A review of process parameters before, during, and after the event, demonstrates that the SRC COT1 TGU did not exceed any emissions limits during the downtime periods.
- From November 2, 2013, through December 26, 2013, the SRC COT2 TGU SO<sub>2</sub> and CO CEMS experienced several episodes of downtime totaling sixty-seven (67) hours as a result of equipment malfunctions and preventive maintenance. A review of process parameters before, during, and after the event, demonstrates that the SRC COT1 TGU did not exceed any emissions limits during the downtime periods.
- From July 20, 2013, through September 24, 2013, the FCU 500 NO<sub>x</sub>, CO, and SO<sub>2</sub> CEMS experienced thirty-six (36), thirty-six (36), and thirty-five (35) hours of downtime, respectively, as a result of many factors, ultimately related to repeated preventive maintenance on the sample system. A review of the process parameters, before and after the events, i.e., unit feed rate, ammonia injection rates, regenerator bed temperature, percent excess oxygen, feed sulfur analysis, and SO<sub>x</sub> additive injection rate demonstrate that the FCU 500 did not exceed any emissions limits during the CEMS downtime period.
- From July 20, 2013, through September 24, 2013, the FCU 600 NO<sub>x</sub>, CO, and SO<sub>2</sub> CEMS experienced forty-eight (48), thirty (30), and one hundred nine (109) hours of downtime, respectively, as a result of many factors, ultimately related to repeated preventive maintenance on the sample system. A review of the process parameters, before and after the events, i.e., unit feed rate, ammonia injection rates, regenerator bed temperature, percent excess oxygen, feed sulfur analysis, and SO<sub>x</sub> additive injection rate demonstrate that the FCU 600 did not exceed any emissions limits during the CEMS downtime period.
- On October 14, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 31 experienced one (1) hour each of downtime as a result of the quarterly Linearity check.
- On October 14, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 32 experienced one (1) hour each of downtime as a result of preventive maintenance. On October 16, 2013, the NO<sub>x</sub> and CO CEMS experienced one (1) hour each of downtime as a result of the quarterly Linearity check. On October 21, 2013, the NO<sub>x</sub> CEMS experienced two (2) hours of downtime as a result of preventive maintenance.

January 27, 2014

Page -4-

- On October 6, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 33 experienced one (1) hour each of downtime as a result of the quarterly Linearity check. On October 13, 2013, the NO<sub>x</sub> CEMS experienced two (2) hours of downtime as a result of preventive maintenance.
- On October 5, 2013, the NO<sub>x</sub> and CO CEMS at 3SPS Boiler 34 experienced one (1) hour each of downtime as a result of the quarterly Linearity check.
- On December 5, 2013, the NO<sub>x</sub> CEMS at 3SPS Boiler 36 experienced four (4) hours of downtime as a result of preventive maintenance.

Excess emissions for fourth quarter occurred at the FCU 600 CO CEMS and DDU Flare H<sub>2</sub>S CEMS, as summarized below.

- On November 12, 2013, the 1-hour rolling average for CO at the FCU 600 was exceeded for two (2) hours, as a result of a bad calibration value on the automatic control system, which increased the combustion air rate to the regenerator. This had the effect of cooling the regenerator bed, leading to elevated CO emissions.
- On December 4, 2013, the 1-hour rolling average for CO at the FCU 600 was exceeded for ten (10) hours, as a result of lost carrier air to the regenerator.
- On December 10, 2013, the 3-hour rolling average for H<sub>2</sub>S at the DDU Flare was exceeded for five (5) hours, as a result of freezing temperatures that caused a frozen wet gas header and high sulfur wet gas material venting to the flare.

The Summary, Excess Emissions, Downtime, and results of the Cylinder Gas Audit are included in this report for the temporary CEMS only.

Additional detail on these excess emissions and analyzer downtime episodes and corrective actions taken can be found in the excess emissions and downtime reports, included in Attachment B.

Table 1. Emission Units and Relevant Pollutants Monitored by CEMS

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<b>Cat. Feed Hydrotreating Unit (CFHU) Fuel Drum</b>				
- CFHU heater F-801A/B - CFHU heater F-801 C	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- CFHU heater F-801A/B - CFHU heater F-801 C	Total sulfur	Permit Section D.19	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
<b>Ultraformer Isomerization Unit / Catalytic Refining Unit (UIU/CRU) Fuel Drum</b>				
- Isomerization Unit (ISOM) heater H-1 - Catalytic Refining Unit (CRU) heater F-101 - CRU heater F-102A	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	

January 27, 2014

Page -5-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<ul style="list-style-type: none"> <li>- ISOM heater H-1</li> <li>- CRU heater F-101</li> <li>- CRU heater F-102A</li> </ul>	Total Sulfur	Permit Section D.9 and D.20	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
<b>#4 Ultraformer (4 UF) Fuel Drum</b>				
<ul style="list-style-type: none"> <li>- 4 UF heater F-1</li> <li>- 4 UF heater F-2</li> <li>- 4 UF heater F-3</li> <li>- 4 UF heater F-4</li> <li>- 4 UF heater F-5</li> <li>- 4 UF heater F-6</li> <li>- 4 UF heater F-7</li> <li>- 4 UF heater F-8A</li> <li>- 4 UF heater F-8B</li> <li>- Blending Oil Unit (BOU) heater F-401</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
<ul style="list-style-type: none"> <li>- #4 UF heater F-1</li> <li>- #4 UF heater F-2</li> <li>- #4 UF heater F-3</li> <li>- #4 UF heater F-4</li> <li>- #4 UF heater F-5</li> <li>- #4 UF heater F-6</li> <li>- #4 UF heater F-7</li> <li>- #4 UF heater F-8A</li> <li>- #4 UF heater F-8B</li> <li>- BOU heater F-401</li> </ul>	Total Sulfur	Permit Section D.16  Permit Section D.11	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
<b>DDU Flare</b>	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	

January 27, 2014

Page -6-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<b>Sulfur Recovery Unit (SRU) Mix Fuel Drum</b>				
<ul style="list-style-type: none"> <li>- 3SPS Boiler 31</li> <li>- 3SPS Boiler 32</li> <li>- 3SPS Boiler 33</li> <li>- 3SPS Boiler 34</li> <li>- 3SPS Boiler 36</li> <li>- No. 11 Pipe Still (11 PS) heater H-1X</li> <li>- 11 PS heater H-2</li> <li>- 11 PS heater H-3</li> <li>- No. 11B Coker heater H-101</li> <li>- No. 11B Coker heater H-102</li> <li>- No. 11B Coker heater H-103</li> <li>- No. 11B Coker heater H-104</li> <li>- 11 PS heater H-200</li> <li>- 11 PS heater H-300</li> <li>- Aromatics Recovery Unit (ARU) heater F-200A</li> <li>- ARU heater F-200B</li> <li>- Distillate Desulfurization Unit (DDU) heater WB-301</li> <li>- DDU heater WB-302</li> <li>- Hydrogen Unit (HU) heater B-501 for refinery fuel gas</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
<ul style="list-style-type: none"> <li>- 3SPS Duct Burner 1</li> <li>- 3SPS Duct Burner 2</li> <li>- 3SPS Duct Burner 3</li> <li>- 3SPS Duct Burner 4</li> <li>- 3SPS Duct Burner 6</li> <li>- 12 PS heater H-101A</li> <li>- 12 PS heater H-101B</li> <li>- 12 PS heater H-102</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	3SPS Duct Burner 6 started up in January 2011
<ul style="list-style-type: none"> <li>- #2 Coker heater F-201</li> <li>- #2 Coker heater F-202</li> <li>- #2 Coker heater F-203</li> </ul>	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	<p>Not included in this report because the following units have not yet started up.</p> <p>Note the #2 Coker heaters F-201, 202, and 203 are labeled H-201, 202, and 203 in the permit.</p>

January 27, 2014

Page -7-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
<ul style="list-style-type: none"> <li>- 11 PS heater H-1X</li> <li>- 11 PS heater H-2</li> <li>- 11 PS heater H-3</li> <li>- 11 PS heater H-200</li> <li>- 11 PS heater H-300</li> <li>- ARU heater F-200A</li> <li>- ARU heater F-200B</li> <li>- DDU heater WB-301</li> <li>- DDD heater WB-302</li> <li>- HU heater B-501 for refinery fuel gas</li> <li>- 3SPS Boiler 31</li> <li>- 3SPS Boiler 32</li> <li>- 3SPS Boiler 33</li> <li>- 3SPS Boiler 34</li> <li>- 3SPS Boiler 36</li> <li>- 12 PS heater H-101A</li> <li>- 12 PS heater H-101B</li> <li>- 12 PS heater H-102</li> <li>- #2 Coker heater F-201</li> <li>- #2 Coker heater F-202</li> <li>- #2 Coker heater F-203</li> </ul>	Total Sulfur	Permit Section D.1  Permit Section D.10  Permit Section D.18  Permit Section D.17  N/A  Permit Section D.3  Permit Section D.2  Permit Section D.42	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>          3SPS Boilers 1, 2, 3, 4, and 6 are not required to be monitored for Total Sulfur.   Unit started up in June 2013   Unit has not started up   Unit has not started up
- #2 Coker heater F-201	NOx	Permit Section D.2	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
- #2 Coker heater F-201	CO	Permit Section D.2	326 IAC 3-5-7	
- #2 Coker heater F-202	NOx	Permit Section D.2	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
- #2 Coker heater F-202	CO	Permit Section D.2	326 IAC 3-5-7	
- #2 Coker heater F-203	NOx	Permit Section D.2	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
- #2 Coker heater F-203	CO	Permit Section D.2	326 IAC 3-5-7	
- 12 PS heater H-101A	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
- 12 PS heater H-101A	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
- 12 PS heater H-101B	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
- 12 PS heater H-101B	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
- 12 PS heater H-102	NOx	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
- 12 PS heater H-102	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
- Distillate Hydrotreating (DHT) Unit heater B-601A	NOx	Permit Section D.37	326 IAC 3-5-7	
- DHT Unit heater B-601A	CO	Permit Section D.37	326 IAC 3-5-7	
GOHT Flare - Routine or planned non-routine streams	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on October 4, 2013.
GOHT Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on October 4, 2013.

January 27, 2014

Page -8-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
South Flare - Routine or planned non-routine streams	H <sub>2</sub> S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on May 17, 2013.
South Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on May 17, 2013.
Sodium Bisulfite Tail Gas Unit (SBS TGU)	SO <sub>2</sub>	§60.105(a)(5)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
Beavon Stretford Tail Gas Unit (B/S TGU)	TRS measured as SO <sub>2</sub>	§60.105(a)(7)	326 IAC 3-5-7 and 40 CFR 60.7(c)	This unit complies with requirements through an AMP approved per §60.105(a)(7)(ii) on Aug. 30, 2006
SRU Standby Incinerator	SO <sub>2</sub>	§60.105(a)(7)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
SRU Claus Offgas Treater #1 (COT1)	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on September 8, 2013.
SRU COT1	SO <sub>2</sub>	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on September 8, 2013.
SRU COT2	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on November 15, 2013.
SRU COT2	SO <sub>2</sub>	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on November 15, 2013.
Fluid Catalytic Cracking Unit 500 (FCU-500)	NO <sub>x</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
FCU-500	CO	40 CFR 63, subpart UUU [40 CFR 60.1565(a)(1)] and §60.105(a)(2)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-500	SO <sub>2</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
Fluid Catalytic Cracking Unit 600 (FCU-600)	NO <sub>x</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
FCU-600	CO	40 CFR 63, subpart UUU [40 CFR 60.1565(a)(1)] and §60.105(a)(2)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-600	SO <sub>2</sub>	Consent Decree 2:96CV095RL	326 IAC 3-5-7	
3SPS Boiler 31	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 31 and Duct Burner 1 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 32	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 32 and Duct Burner 2 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 33	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 33 and Duct Burner 3 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 34	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	
3SPS Boiler 34 and Duct Burner 4 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 36	NO <sub>x</sub>	326 IAC 10-4	326 IAC 3-5-7 <sup>2</sup>	

January 27, 2014

Page -9-

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
3SPS Boiler 36 and Duct Burner 6 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	Duct Burner 6 started up in January 2011

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

<sup>2</sup> BP Whiting has chosen to also include the NO<sub>x</sub> CEMS Summary Performance Report for the 3SPS, which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. The 3SPS boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

In addition to the units listed in Table 1, BP Whiting is exempt from some continuous monitoring requirements through exemptions to NSPS J promulgated on June 24, 2008, after the operating permit was issued, and is complying with monitoring requirements in Operating Permit No. T089-6741-00453, for SPM No. 089-29033-00453, through approved Alternate Monitoring Plans (AMPs). 40 CFR 60, Subpart Ja is not effective until November 13, 2012, and there are no approved AMPs in use at BP Whiting at this time. Emission units and details of the exemptions and approved AMPs are provided below.

- The Chemical Grade Propylene (CGP) and Refinery Grade Propylene (RGP) streams vented during propylene loading are subject to the AMP approved June 17, 2011, that does not require monitoring because of the customer specification for low H<sub>2</sub>S concentrations.<sup>1</sup>
- Per 40 CFR 60.105(a)(4)(iv)(B), Polymer Grade Propylene (PGP) stream vented during propylene loading is exempt from the H<sub>2</sub>S limits and monitoring requirements because it meets a commercial-grade product specification less than 30 ppmv.<sup>1</sup>
- Per 40 CFR 60.105(a)(4)(iv)(C), the Hydrogen Unit (HU) heater B-501 is exempt from the H<sub>2</sub>S concentration limits and monitoring requirements because it combusts a fuel gas stream that is inherently low in sulfur content.
- Per 40 CFR 60.105(a)(4)(iv)(B), the LPG Flare is exempt from the H<sub>2</sub>S limits and monitoring requirements because only commercial grade LPG streams are tied to the flare.
- The two thermal oxidizers (Indiana Tank Farm Thermal Oxidizer & Berry Lake Tank Farm Thermal Oxidizer) are subject to the AMP approved per §60.105(a)(4) on January 9, 2006, requiring hydrogen sulfide (H<sub>2</sub>S) grab samples per steps established in the AMP.
- The Marketing Terminal - Vapor Combustion Unit (VCU) is subject to the AMP approved per §60.105(a)(4) on March 22, 2007, that does not require monitoring because there are relatively low H<sub>2</sub>S concentrations in the stream being loaded.

Attachment A contains the CEMS summary report per 40 CFR 60.7(c) and (d).

Attachment B contains the excess emission report and CEMS downtime report per 326 IAC 3-5-7 and 40 CFR 60.7(c).

<sup>1</sup> The CGP, RGP, and PGP vent streams are not combusted at BP Whiting under normal operating scenarios.

January 27, 2014

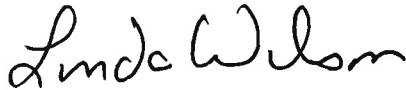
Page -10-

Attachment C, where applicable, contains the results of the cylinder gas audits.

Attachment D contains the complete CEMS summary report, excess emission report, CEMS downtime report, and, where applicable, the results of the cylinder gas audits as provided by Praxair, Inc. for the CEMS currently operating at the New Hydrogen Unit (Section D.43).

If you have any questions or comments about the enclosed information, please contact Brandon Mik at (219) 473-3725.

Sincerely,



Linda Wilson  
Environmental Manager  
Health, Safety, Security and Environment

#### Attachments

cc: R. Tejuja - IDEM/NW Indiana (rtejuja@idem.in.gov)

**PART 70 OPERATING PERMIT  
CERTIFICATION**

Source Name: BP Products North America, Inc., Whiting Business Unit  
Source Address: 2815 Indianapolis Blvd., Whiting, IN 46394  
Mailing Address: P.O. Box 710, Whiting, Indiana 46394-0710  
Permit No.: T089-6741-00453  
Last updated on April 23, 2013, per SPM 089-32755-00453

**This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.**

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☐ Test Results (specify)

☒ Report (Fourth Quarter 2013 CEM Summary Report per 326 IAC 3-5-7, 40 CFR 60.7(c), 326 IAC 10-4, and 40 CFR Part 75)

☐ Notification (specify)

☐ Affidavit (specify)

☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Signature of Responsible Official:



Printed Name:

Nick. Spencer

Title/Position:

Whiting Business Unit Leader

Phone:

(219) 473-3179

Date:

27<sup>th</sup> Jan. 2014

## Attachment A

### CEMS Summary Report per 40 CFR 60.7(c) & (d) and 326 IAC 3-5-7

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H <sub>2</sub> S	
CFU Fuel Drum	Total Sulfur	CEMS began operation on March 27, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
CRU Fuel Drum	H <sub>2</sub> S	
CRU Fuel Drum	Total Sulfur	Not included in this report because the Total Sulfur CEMS has not yet been installed <sup>1</sup>
4UF Fuel Drum	H <sub>2</sub> S	
4UF Fuel Drum	Total Sulfur	CEMS began operation on March 27, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
#2 Coker Merox Treater Off-Gas	TS	CEMS began operation on November 14, 2013.
DDU Flare	H <sub>2</sub> S	
SRU Mix Fuel Drum	H <sub>2</sub> S	
SRU Mix Fuel Drum	Total Sulfur	CEMS began operation on November 22, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
#2 Coker heater F-201	NO <sub>x</sub>	CEMS began operation on November 6, 2013.
#2 Coker heater F-201	CO	CEMS began operation on November 6, 2013.
#2 Coker heater F-202	NO <sub>x</sub>	CEMS began operation on November 6, 2013.
#2 Coker heater F-202	CO	CEMS began operation on November 6, 2013.
#2 Coker heater F-203	NO <sub>x</sub>	CEMS began operation on November 6, 2013.
#2 Coker heater F-203	CO	CEMS began operation on November 6, 2013.
12 PS heater H-101A	NO <sub>x</sub>	CEMS began operation on June 17, 2013.
12 PS heater H-101A	CO	CEMS began operation on June 17, 2013.
12 PS heater H-101B	NO <sub>x</sub>	CEMS began operation on June 19, 2013.
12 PS heater H-101B	CO	CEMS began operation on June 19, 2013.
12 PS heater H-102	NO <sub>x</sub>	CEMS began operation on June 23, 2013.
12 PS heater H-102	CO	CEMS began operation on June 23, 2013.
DHT heater B-601A	NO <sub>x</sub>	
DHT heater B-601A	CO	
GOHT Flare	H <sub>2</sub> S	CEMS began operation on October 4, 2013.
GOHT Flare	Total Sulfur	CEMS began operation on October 4, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
South Flare	H <sub>2</sub> S	CEMS began operation on May 17, 2013.
South Flare	Total Sulfur	CEMS began operation on May 17, 2013. No summary report available as the TS CEMS is not subject to an emission limit.
B/S TGU	TRS	
SBS TGU	SO <sub>2</sub>	
SRU Standby Incinerator	SO <sub>2</sub>	
COT1	CO	CEMS began operation on September 8, 2013.
COT1	SO <sub>2</sub>	CEMS began operation on September 8, 2013.
COT2	CO	CEMS began operation on November 15, 2013.
COT2	SO <sub>2</sub>	CEMS began operation on November 15, 2013.
FCU 500	NO <sub>x</sub>	7-day rolling average
FCU 500	NO <sub>x</sub>	365-day rolling average

Location/Emission Unit	Parameter	Notes
FCU 500	CO	
FCU 500	SO <sub>2</sub>	7-day rolling average
FCU 500	SO <sub>2</sub>	365-day rolling average
FCU 600	NO <sub>x</sub>	7-day rolling average
FCU 600	NO <sub>x</sub>	365-day rolling average
FCU 600	CO	
FCU 600	SO <sub>2</sub>	7-day rolling average
FCU 600	SO <sub>2</sub>	365-day rolling average
3SPS Boiler 31 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 31 and Duct Burner 1 <sup>2</sup>	CO	
3SPS Boiler 32 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 32 and Duct Burner 2 <sup>2</sup>	CO	
3SPS Boiler 33 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 33 and Duct Burner 3 <sup>2</sup>	CO	
3SPS Boiler 34 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 34 and Duct Burner 4 <sup>2</sup>	CO	
3SPS Boiler 36 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 36 and Duct Burner 6 <sup>2</sup>	CO	

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization Project (WRMP) are not required until the completion of the WRMP.

<sup>2</sup> The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 12/17/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	1	0.05
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	3	0.14
4. Other Known Causes	3	0.14
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

B. Mik

SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 60 ppmvd per 365-day rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 12/17/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	1	0.05
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	3	0.14
4. Other Known Causes	3	0.14
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours

(1) % Unavailable is calculated by the following formula:

$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/22/2014 09:03**

**Pollutant: H2S**

**Emission Limit: 162 PPM (3 Hour Rolling Average)\***

**Date of Latest CEMS Certification or Audit: 12/31/2013 (CGA)**

Company Name: BP Products North America, Inc

Address: 2815 Indianapolis Whiting, IN 46394

Unit Description: Catalytic Refining Unit (CRU)

Total source operating time in reporting period: **2208.0 hours**

<b>Emission Data Summary(note 1 )</b>		<b>CEMS Downtime Summary(note 1 )</b>	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	369.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	369.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	16.71%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.

<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon McK

Signature: B McK

Title: Environmental Engineer

Date: 01/27/14

Indiana Department of Environmental Management  
Office of Air QualitySummary Report  
Excess Emission and Monitoring System Performance  
Version 43.0Reporting dates 7/1/2013 00:00 through 9/30/2013 23:59  
Generated: 10/21/2013 10:35

Pollutant: H2S

Emission Limit: 60 ppm (365 Day Rolling Average)

Date of Latest CEMS Certification or Audit: 12/31/2013 (CGA)

Company Name: BP Products North America, Inc

Address: 2815 Indianapolis Whiting, IN 46394

Unit Description: Catalytic Refining Unit (CRU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	369.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	369.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	16.71%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name:

Brandon Mik

Signature:

B Mik

Title: Environmental Engineer

Date:

01/27/14

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 12/19/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	2	0.09
3. Calibration/QA	1	0.05
4. Other Known Causes	1	0.05
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.18

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 60 ppmvd per 365-day rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 12/19/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	2	0.09
3. Calibration/QA	1	0.05
4. Other Known Causes	1	0.05
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.18

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/22/2014 09:03

Pollutant: H2S

Emission Limit: 162 PPM (3 Hour Rolling Average)\*

Date of Latest CEMS Certification or Audit: 12/04/2013 (CGA)

Company Name: BP Products North America, Inc

Address: 2815 Indianapolis Whiting, IN 46394

Unit Description: Distillate Desulfuration Unit (DDU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	5.0	d. Other Known Monitor Downtime Cause.....	6.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	5.0	2. Total duration of CEMS downtime.....	6.0
3. Excess emission duration (%).....	0.23%	3. CEMS downtime (%).....	0.27%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.

<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MikSignature: 

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:39

Pollutant: H2S

Emission Limit: 162 ppm (3 Hour Rolling Average)

Date of Latest CEMS Certification or Audit: 11/22/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Sulfur Recovery Unit (SRU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon NeilSignature: B Neil

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:39

Pollutant: H2S

Emission Limit: 60 ppm (365 Day Rolling Average)

Date of Latest CEMS Certification or Audit: 11/22/2013 (RATA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Sulfur Recovery Unit (SRU)

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MSKSignature: B. Thiel

Title: Environmental Engineer

Date: 01/27/14

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S 365 Day

Emission Limitation: 60 ppmvd per 365-day rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 11/22/2013 (RATA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H<sub>2</sub>S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 11/22/2013 (RATA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CEMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day  
Emission Limitation: 60 ppm  
Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 12/27/2013

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 29.5 tons per 12 consecutive month

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 12/27/2013

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day

Emission Limitation: 60 ppm

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 12/27/2013

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CEMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 29.5 tons per 12 consecutive month

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 12/27/2013

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

1. CEMS downtime in reporting period due to:

1. Monitor Equipment Malfunctions

2. Non-Monitor CEMS Equipment Malfunction

3. Calibration/QA

4. Other Known Causes

5. Unknown Causes

2. Total CEMS Downtime

Duration	% Unavailable (1)
0	0.00
0	0.00
0	0.00
0	0.00
0	0.00
0	0.00

Durations in hours

(1) % Unavailable is calculated by the following formula:

$$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$$

Emission Data Summary

1. Duration of excess emissions in reporting period due to:

1. Startup/Shutdown

2. Control Equip Problems

3. Process Problems

4. Other Known Causes

5. Unknown Causes

2. Total duration of excess emissions

Duration	% Excess Emissions (2)
0	0.00
0	0.00
0	0.00
0	0.00
0	0.00
0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

6/27/14  
DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day

Emission Limitation: 60 ppm

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: 12/02/2013

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	1	0.05
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 27.5 tons per 12 consecutive month

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: 12/02/2013

Total Source Operating Time in Reporting Period: 185 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	1	0.05
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE



DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOX

Emission Limitation: 7.3 tons per 12 consecutive month period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc. - Whiting Bus

Address: 2815 Indianapolis Blvd, Whiting IN 46307

Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 11/26/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	1	0.05
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

B. Mik

SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO

Emission Limitation: 7.3 tons per 12 consecutive month period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc. - Whiting Bus

Address: 2815 Indianapolis Blvd, Whiting IN 46307

Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 11/26/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	1	0.05
3. Calibration/QA	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours

(1) % Unavailable is calculated by the following formula:

$\% \text{ Unavailable} = \text{CEMS Downtime during Source Operating Time} / \text{Source Operating Time} \times 100$

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

$\% \text{ Excess Emissions} = \text{Total Duration of Excess Emissions} / \text{Source Operating Time} \times 100$

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME

  
SIGNATURE

Environmental Engineer

TITLE

01/27/14  
DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: GOHT Flare

Date of Last CEMS Certification or Audit: N/A

Total Source Operating Time in Reporting Period: 2136 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	3	0.14
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	0	0.00
4. Other Known Causes	1	0.05
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.19

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

Continuous Emission Monitor Quarterly Report Summary  
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S

Emission Limitation: 162 ppmvd per 3-hour rolling period

Reporting Period Dates: From 10/01/2013 To 12/31/2013

Company Name: BP Products North America, Inc.

Address: Whiting Refinery

Process Unit Description: South Flare

Date of Last CEMS Certification or Audit: 12/29/2013 (CGA)

Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary

Total CEMS Downtimes including  
exemptions

	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1. Monitor Equipment Malfunctions	0	0.00
2. Non-Monitor CEMS Equipment Malfunction	0	0.00
3. Calibration/QA	3	0.14
4. Other Known Causes	29	1.31
5. Unknown Causes	0	0.00
2. Total CEMS Downtime	3	1.45

Durations in hours

(1) % Unavailable is calculated by the following formula:

% Unavailable = CEMS Downtime during Source Operating Time / Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions (2)
1. Duration of excess emissions in reporting period due to:		
1. Startup/Shutdown	0	0.00
2. Control Equip Problems	0	0.00
3. Process Problems	0	0.00
4. Other Known Causes	0	0.00
5. Unknown Causes	0	0.00
2. Total duration of excess emissions	0	0.00

Durations in hours

(2) % Excess Emissions is calculated by the following formulas:

% Excess Emissions = Total Duration of Excess Emissions / Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Brandon Mik

NAME



SIGNATURE

Environmental Engineer

TITLE

01/27/14

DATE

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:40

Pollutant: Total Reduced Sulfur (TRS)  
Emission Limit: 250 ppm (12 Hour Rolling Average)  
Date of Latest CEMS Certification or Audit: N/A

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Beavon Stretford Tail Gas Unit (B/S TGU)

Total source operating time in reporting period: **1248.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. "

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K

Signature: [Signature]

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:39**

**Pollutant: SO2  
Emission Limit: 250 ppm (12 Hour Rolling Average)  
Date of Latest CEMS Certification or Audit: N/A**

Company Name: BP Products North America, Inc.  
Address: 2815 Indianapolis Blvd. Whiting, IN 46394  
Unit Description: Sodium Bisulfite Tail Gas Unit (SBS TGU)

Total source operating time in reporting period: **1200.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. K

Signature: B. K

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:39

Pollutant: SO2

Emission Limit: 250 ppm (12 Hour Rolling Average)

Date of Latest CEMS Certification or Audit: N/A

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Sulfur Recovery Unit Standby Incinerator

Total source operating time in reporting period: 1272.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.KSignature: B. M.K.

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: SO2

Emission Limit: 50 PPM (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 10/07/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	27.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	8.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	35.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.59%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name:

Brandon Mik

Signature:

B Mik

Title: Environmental Engineer

Date:

01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28**

**Pollutant: SO2**

**Emission Limit: 25 ppm (365-Day Rolling Average)**

**Date of Latest CEMS Certification or Audit: 10/07/2013 (CGA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	27.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction.....	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	8.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	35.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.59%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mik

Signature: B. Mik

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28**

**Pollutant: CO**

**Emission Limit: 500 ppm (1 Hour Block Average)**

**Date of Latest CEMS Certification or Audit: 10/07/2013 (CGA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	28.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	8.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	36.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.63%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mirk

Signature: [Signature]

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: NOx

Emission Limit: 80 ppm (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 10/07/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	28.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	8.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	36.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.63%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.KSignature: [Signature]

Title: Environmental Engineer

Date: 01/27/14

Indiana Department of Environmental Management  
Office of Air QualitySummary Report  
Excess Emission and Monitoring System Performance  
Version 43.0Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: NOx

Emission Limit: 40 ppm (365-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 10/07/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	28.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	8.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	36.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.63%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

- 1 For gases, record all times in hours.
- 2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
- 3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name:

Brandon Mik

Signature:

B Mik

Title: Environmental Engineer

Date:

01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: NOx

Emission Limit: 40 ppm (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 11/26/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	48.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction....	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	48.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	2.17%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MirkSignature: B Mirk

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28**

**Pollutant: NOx**

**Emission Limit: 20 ppm (365-day rolling average)**

**Date of Latest CEMS Certification or Audit: 11/26/2013 (CGA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	48.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	48.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	2.17%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

**Note(s):**

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Mik

Signature: B. Mik

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: CO

Emission Limit: 500 ppm (1 Hour Block Average)

Date of Latest CEMS Certification or Audit: 11/26/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	30.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	12.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	12.0	2. Total duration of CEMS downtime.....	30.0
3. Excess emission duration (%).....	0.54%	3. CEMS downtime (%).....	1.36%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MikSignature: B Mik

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: SO<sub>2</sub>

Emission Limit: 125 ppm (7-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 11/26/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	109.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	109.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	4.94%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

<sup>1</sup> For gases, record all times in hours.<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.<sup>3</sup> Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon McKSignature: [Signature]

Title: Environmental Engineer

Date: 01/27/14

Indiana Department of Environmental Management  
Office of Air QualitySummary Report  
Excess Emission and Monitoring System Performance  
Version 43.0Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:28

Pollutant: SO2

Emission Limit: 50 ppm (365-Day Rolling Average)

Date of Latest CEMS Certification or Audit: 11/26/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	109.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	109.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	4.94%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

1 For gases, record all times in hours.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MirkSignature: B. Mirk

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 10/14/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 31

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.05%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.KSignature: B. M.K.

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 10/16/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 32

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	3.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	4.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.18%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MikSignature: B. Mik

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 10/06/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 33

Total source operating time in reporting period: 2166.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	2.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	3.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.14%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

## Note(s):

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M.KSignature: B. M.K.

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02

Pollutant: NOx

Emission Limit: 0.02 lb/mmBTU (365-day rolling average)

Date of Latest CEMS Certification or Audit: 10/05/2013 (CGA)

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 34

Total source operating time in reporting period: 2208.0 hours

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.05%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

## Note(s):

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon M. KSignature: B. M. K

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02**

**Pollutant: NOx****Emission Limit: 0.02 lb/mmBTU (365-day rolling average)****Date of Latest CEMS Certification or Audit: 10/04/2013 (CGA)**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boiler 36

Total source operating time in reporting period: **1683.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	4.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.24%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

**Note(s):**

1 For gases, record all times in hours. For opacity, record all times in minutes.

2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon MikSignature: B Mik

Title: Environmental Engineer

Date: 01/27/14

**Indiana Department of Environmental Management  
Office of Air Quality**

**Summary Report  
Excess Emission and Monitoring System Performance  
Version 43.0**

**Reporting dates 10/1/2013 00:00 through 12/31/2013 23:59  
Generated: 1/9/2014 21:02**

**Pollutant: CO**

**Emission Limit: 260.4 tons per 12 consecutive month total**

Company Name: BP Products North America, Inc.

Address: 2815 Indianapolis Blvd. Whiting, IN 46394

Unit Description: 3sps Boilers 31, 32, 33, 34 & 36

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1 )		CEMS Downtime Summary(note 1 )	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	4.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%
Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.			

**Note(s):**

<sup>1</sup> For gases, record all times in hours. For opacity, record all times in minutes.

<sup>2</sup> For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: Brandon Misk

Signature: B. Misk

Title: Environmental Engineer

Date: 01/27/14

## **Attachment B**

### **Excess Emission and CEMS Downtime Report per 325 IAC 3-5-7 and 40 CFR 60.7(c)**

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S - 3 hr

Limit: 162

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 21:42:26

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S - 365 Day

Limit: 60

Data in the Reporting Period: 07/01/13 to 09/30/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 10/21/13 11:28:14

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 09:05

Pollutant: H2S\_CRU Episode: H2S CRU Analyzer Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No H2S CRU Analyzer Excess during the Report Period				

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 3 hr

Limit: 162

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 21:38:54

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: No. 4 Ultraformer

Limit: 60

Parameter: H2S - 365 Day

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 21:38:57

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: MEROX

Limit: 162

Parameter: TS Raw - 3 hr

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 34 hours

Report Printed on: 01/09/14 22:28:59

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS Raw - 365 day

Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 34 hours

Report Printed on: 01/09/14 22:29:03

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 09:04

Pollutant: H2S\_DDU Episode: H2S DDU Analyzer Excess

Incident Start	Incident End	Duration Hours	Value	Cause of Episode	Corrective Action
12/10/2013 19:00	12/10/2013 19:59	1	171.1	Due to freezing temperatures, causing a frozen wet gas header, high sulfur wet gas material was vented to the DDU	The frozen wet gas line was thawed, venting concluded, and H2S levels returned to normal.
12/10/2013 20:00	12/10/2013 20:59	1	217.7		
12/10/2013 21:00	12/10/2013 21:59	1	295.8	Flare causing an exceedance of the	
12/10/2013 22:00	12/10/2013 22:59	1	247.0	three (3) hour hydrogen sulfide (H2S)	
12/10/2013 23:00	12/10/2013 23:59	1	177.3		

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 6.0 Hours

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:40

Pollutant: H2S\_SRU Episode: SRU H2S Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SRU H2S Excess during the Report Period

Facility Name:

BP Products North America, Inc.

Location:

Whiting Refinery

Source:

Sulfur Recovery Unit

Parameter:

H2S - 3 hr

Limit:

162

Data in the Reporting Period:

10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 960 hours

Report Printed on: 01/09/14 22:58:25

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Sulfur Recovery Unit

Parameter: H<sub>2</sub>S - 365 day Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 960 hours  
Report Printed on: 01/09/14 22:58:27

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery  
Source: Heater H-101A  
Parameter: NOX @ 0% O2 30 Day Limit: 60  
Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 01/09/14 22:06:55

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO per 12 consecutive month Limit: 29.5 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/09/14 22:06:58

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOx @ 0% 02 30 Day

Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc NO <sub>x</sub>	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 01/09/14 22:08:07

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO per 12 consecutive month

Limit: 29.5 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 01/09/14 22:08:10

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX @ 0% O2 30 Day Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/09/14 22:09:35

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: CO per 12 consecutive month Limit: 27.5 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/09/14 22:09:38

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery  
Source: Heater F-201  
Parameter: NOx @ 0% O2 30-Day Limit: 60  
Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 1320 hours  
Report Printed on: 01/09/14 22:22:28

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1320 hours  
 Report Printed on: 01/09/14 22:22:28

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-202

Parameter: NOx @ 0% O2 30-Day Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1320 hours  
 Report Printed on: 01/09/14 22:26:51

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery  
 Source: Heater F-202  
 Parameter: CO per 12 consecutive month Limit: 17.3 tons  
 Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1320 hours  
 Report Printed on: 01/09/14 22:26:51

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: NOx @ 0% 02 30-Day Limit: 60

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1320 hours  
 Report Printed on: 01/09/14 22:27:54

# Excess Emissions Report

**Facility Name:** BP Products North America, Inc.      **Location:** Whiting Refinery  
**Source:** Heater F-203  
**Parameter:** CO per 12 consecutive month      **Limit:** 17.3 tons  
**Data in the Reporting Period:** 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1320 hours  
 Report Printed on: 01/09/14 22:27:54

# Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOX Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/09/14 22:36:31

# Excess Emissions Report

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Facility Name: BP Products North America, Inc. - Whiting Bus

Source: DHT

Parameter: CO Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 22:36:29

# Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S ppmvd 3-hr

Limit: 162

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2136 hours

Report Printed on: 01/09/14 22:11:02

# Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: H2S ppmd 3-hr

Limit: 162

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 22:11:02

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:40

Pollutant: TRS\_TGU Episode: TRS TGU 12 hr Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No TRS TGU 12 hr Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:40

Pollutant: SO2COR\_SBS Episode: SBS SO2 12 hr Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SBS SO2 12 hr Excess during the Report Period

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:40

Pollutant: SO2COR\_INC Episode: SRU SO2 Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SRU SO2 Excess during the Report Period

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 @ 0% O2

Limit: 250.0

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 01/09/14 22:55:57

# Excess Emissions Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Tail Gas Unit A

Parameter: CO per 12 consecutive month

Limit: 55.0 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/09/14 22:55:57

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: SO2 @ 0% O2 Limit: 250.0

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1215 hours  
 Report Printed on: 01/09/14 22:57:05

# Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: CO per 12 consecutive month Limit: 55.0 tons

Data in the Reporting Period: 10/01/13 to 12/31/13

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours  
 Total Operating Time in the Reporting Period = 1215 hours  
 Report Printed on: 01/09/14 22:57:05

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:33

Pollutant: NOx\_7DyBP5 Episode: FCU 500 NOx Excess 7 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No FCU 500 NOx Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:33

Pollutant: NOx\_365BP5    Episode: FCU 500 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No FCU 500 NOx Excess 365 Day during the Report Period				

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:32

Pollutant: CO\_5 Episode: FCU 500 CO Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No FCU 500 CO Excess during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:33

Pollutant: SO2\_7dyBP5 Episode: FCU 500 SO2 Excess 7 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No FCU 500 SO2 Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:33

Pollutant: SO2\_365BP5 Episode: FCU 500 SO2 Excess 365 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No FCU 500 SO2 Excess 365 Day during the Report Period				

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/9/2014 21:34

Pollutant: NOx\_7DyBP6 Episode: FCU 600 NOx Excess 7 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No FCU 600 NOx Excess 7 Day during the Report Period

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:34

Pollutant: NOx\_365BP6    Episode: FCU 600 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No FCU 600 NOx Excess 365 Day    during the Report Period				

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:32

Pollutant: CO\_6 Episode: FCU 600 CO Excess

Incident Start	Incident End	Duration Hours	Value	Cause of Episode	Corrective Action
11/12/2013 08:00	11/12/2013 08:59	1	566.6	An automatic control system received a bad calibration value, increasing the combustion air rate to the regenerator. This had the effect of cooling the regenerator bed, leading to elevated CO emissions.	The automatic control system was placed in manual mode, stabilising the FCU 600 regenerator operations.
11/12/2013 09:00	11/12/2013 09:59	1	734.8		
12/04/2013 21:00	12/04/2013 21:59	1	762.4	FCU 600 lost carrier air from J1A B	Replaced lost carrier air with steam,
12/04/2013 22:00	12/04/2013 22:59	1	1030.1	case deviation, resulting in a	and commenced torch oil injection into
12/04/2013 23:00	12/04/2013 23:59	1	588.5	regenerator stack CO CEMS exceedance	the FCU 600 regenerator to
12/05/2013 01:00	12/05/2013 01:59	1	1010.1	in excess of 500 ppm for greater than	stabilizethe process.
12/05/2013 02:00	12/05/2013 02:59	1	1031.2	one hour.	
12/05/2013 03:00	12/05/2013 03:59	1	1013.8		
12/05/2013 04:00	12/05/2013 04:59	1	1031.2		
12/05/2013 05:00	12/05/2013 05:59	1	898.2		
12/05/2013 10:00	12/05/2013 10:59	1	941.9		
12/05/2013 12:00	12/05/2013 12:59	1	639.0		

Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:34

Pollutant: SO2\_7DyBP6 Episode: FCU 600 SO2 Excess 7 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No FCU 600 SO2 Excess 7 Day during the Report Period				

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:34

Pollutant: SO2\_365BP6 Episode: FCU 600 SO2 Excess 365 Day

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
			No FCU 600 SO2 Excess 365 Day during the Report Period	

## Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/9/2014 21:02

Pollutant: NOxlbmy\_31 Episode: Unit 31 NOx lbmbbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 31 NOx lbmbbtu 365 day Excess during the Report Period

## Episode List Report

BP Products North America, Inc.

2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/9/2014 21:02

Pollutant: NOxlbmY\_32 Episode: Unit 32 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No	Unit 32 NOx lbmmbtu 365 day Excess	during the Report Period		
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Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:02

Pollutant: NOxlbmy\_33 Episode: Unit 33 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
No Unit 33 NOx lbmmbtu 365 day Excess during the Report Period				

## Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/9/2014 21:02

Pollutant: NOxlbmy\_34 Episode: Unit 34 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 34 NOx lbmmbtu 365 day Excess during the Report Period

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/9/2014 21:02

Pollutant: NOxlbmY\_36 Episode: Unit 36 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 36 NOx lbmmbtu 365 day Excess during the Report Period

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/9/2014 21:02

Pollutant: COTNYR    Episode: CO Tons/Year

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No CO Tons/Year    during the Report Period

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: CFU

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/09/13 05:00:38	12/09/13 07:59:41	3	d. Other known cause	Preventive maintenance	Preventive maintenance
3	12/15/13 05:00:38	12/15/13 07:59:40	3	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit
4	12/17/13 10:00:41	12/17/13 10:59:41	1	a. Monitor equipment malfunction	Analyzer fault	Analyzer fault

Total Downtime in the Reporting Period = 7 hours , Data Availability for this Reporting Period = 99.67 %

Total Operating Time in the Reporting Period = 2100 hours

Report Printed on: 01/23/14 07:54:36

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: TS CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %

Total Operating Time in the Reporting Period = 2100 hours

Report Printed on: 01/23/14 07:54:30

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated : 1/22/2014 20:17

Pollutant: H2S\_CRU Episode: H2S CRU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/19/2013 04:00	12/05/2013 13:00	369	d. Other known cause	Calibration checks were mistakenly halted during this period as it was thought the stream being monitored was not in operation.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 369.0 Hours

# Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/05/13 08:00:39	12/05/13 08:59:39	1	d. Other known cause	Communication Fault 4UF	Repaired communication fault
2	12/19/13 11:00:40	12/19/13 11:59:40	1	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit
3	12/24/13 11:00:38	12/24/13 12:59:38	2	b. Non-monitor equipment malfunction	NAU Malfunction	Reset NAU

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.82 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:54:09

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: No. 4 Ultraformer

Parameter: TS CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/05/13 08:00:39	12/05/13 08:59:39	1	d. Other known cause	Preventive Maintenance	Preventive Maintenance

Total Downtime in the Reporting period = 1 hours , Data Availability for this Reporting Period = 99.05 %  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/23/14 07:54:02

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 34 hours

Report Printed on: 01/23/14 08:01:35

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:17

Pollutant: H2S\_DDU Episode: H2S DDU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/30/2013 08:00	10/30/2013 09:59	2	d. Other known cause	Preventive maintenance on CEMS
11/01/2013 08:00	11/01/2013 10:59	3	d. Other known cause	Preventive maintenance on CEMS
12/04/2013 17:00	12/04/2013 17:59	1	d. Other known cause	Preventive maintenance on CEMS

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 6.0 Hours

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:14

Pollutant: H2S\_SRU Episode: SRU H2S Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SRU H2S Analyzer Downtime during the Report Period

Total Reported Time:

1248.0

TOTAL DURATION:

0.0

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: SRU

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %

Total Operating Time in the Reporting Period = 960 hours

Report Printed on: 01/23/14 08:28:45

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: SRU

Parameter: TS CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %

Total Operating Time in the Reporting Period = 960 hours

Report Printed on: 01/23/14 08:28:40

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater F-201

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:00:20

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:00:25

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Heater F-202

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/17/13 13:00:40	12/17/13 13:59:40	1	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.92 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:00:46

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/16/13 06:00:41	12/16/13 06:00:41	12	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	12/17/13 13:00:40	12/17/13 13:59:40	1	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 13 hours , Data Availability for this Reporting Period = 99.02 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:00:53

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/12/13 07:00:41	11/12/13 15:59:39	9	a. Monitor equipment malfunction	System testing	System testing

Total Downtime in the Reporting Period = 9 hours , Data Availability for this Reporting Period = 99.32 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:01:11

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/12/13 07:00:41	11/12/13 15:59:39	9	a. Monitor equipment malfunction	System testing	System testing

Total Downtime in the Reporting Period = 9 hours , Data Availability for this Reporting Period = 99.32 %

Total Operating Time in the Reporting Period = 1320 hours

Report Printed on: 01/23/14 08:01:16

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incident No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:55:28

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:55:18

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:56:24

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:55:56

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/12/13 02:00:38	11/12/13 02:59:38	1	a. Monitor equipment malfunction	probe heater issue	probe heater issue

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:56:49

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/12/13 02:00:38	11/12/13 02:59:38	1	a. Monitor equipment malfunction	probe heater issue	probe heater issue

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:56:44

# Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incident No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/06/13 17:00:38	12/06/13 17:59:38	1	b. Non-monitor equipment malfunction	Power outage	Power outage

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 08:19:43

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/06/13 17:00:38	12/06/13 17:59:38	1	b. Non-monitor equipment malfunction	Power outage	Power outage

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 08:19:39

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/18/13 05:00:41	10/18/13 07:59:41	3	a. Monitor equipment malfunction	Analyzer malfunction	Analyzer malfunction
2	10/21/13 21:00:41	10/21/13 21:59:41	1	d. Other known cause	Flaring event	Flaring event

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.81 %

Total Operating Time in the Reporting Period = 2136 hours

Report Printed on: 01/23/14 08:22:35

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: GOHT Flare

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %  
 Total Operating Time in the Reporting Period = 2136 hours  
 Report Printed on: 01/23/14 08:22:31

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: South Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid-- No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/18/13 01:00:41	10/18/13 18:59:38	18	d. Other known cause	Flaring event	Flaring event
2	10/24/13 07:00:41	10/24/13 17:59:38	11	d. Other known cause	Flaring event	Flaring event
3	10/31/13 05:00:41	10/31/13 07:59:38	3	c. Quality assurance calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 32 hours , Data Availability for this Reporting Period = 98.55 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:57:21

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %

Total Operating Time in the Reporting Period = 2208 hours

Report Printed on: 01/23/14 07:57:17

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:14

Pollutant: SO2COR\_SBS Episode: SBS S02 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No SBS S02 Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:14

Pollutant: TRS\_TGU Episode: TRS TGU Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No TRS TGU Analyzer Downtime during the Report Period

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:14

Pollutant: SO2RAW\_IN Episode: SRU Incinerator SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Incinerator SO2 Analyzer Downtime during the Report Period

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/09/13 05:00:39	10/10/13 07:59:40	27	a. Monitor equipment malfunction	Sample dryer fault	sample dryer fault
2	10/13/13 17:00:40	10/13/13 17:59:40	1	a. Monitor equipment malfunction	Sample dryer fault	sample dryer fault
3	10/15/13 12:00:39	10/15/13 12:59:39	1	d. Other known cause	Cal check single bad	Cal check single bad
4	10/15/13 17:00:39	10/15/13 17:59:39	1	d. Other known cause	test cal gas locally	test cal gas locally
5	10/17/13 08:00:39	10/17/13 08:59:39	1	d. Other known cause	Calibrated SO2	Calibrated SO2
6	10/18/13 08:00:41	10/18/13 09:59:41	2	b. Non-monitor equipment malfunction	Software issue	Software issue
7	11/13/13 17:00:39	11/13/13 17:59:39	1	a. Monitor equipment malfunction	Calibrated SO2	Calibrated SO2

Total Downtime in the Reporting Period = 34 hours , Data Availability for this Reporting Period = 98.46 %  
 Total Operating Time in the Reporting Period = 2208 hours  
 Report Printed on: 01/23/14 08:27:30

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Tail Gas Unit A

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/09/13 05:00:39	10/10/13 07:59:40	27	a. Monitor equipment malfunction	Sample dryer fault	sample dryer fault
2	10/13/13 17:00:40	10/13/13 17:59:40	1	a. Monitor equipment malfunction	sample dryer fault	sample dryer fault
3	10/15/13 12:00:39	10/15/13 12:59:39	1	d. Other known cause	Cal check single bad	cal check single bad
4	10/15/13 17:00:39	10/15/13 17:59:39	1	d. Other known cause	test cal gas locally	test cal gas locally
5	10/17/13 08:00:39	10/17/13 08:59:39	1	d. Other known cause	Calibrated SO2	Calibrated SO2
6	10/18/13 08:00:41	10/18/13 09:59:41	2	b. Non-monitor equipment malfunction	Software issue	Software issue
7	11/13/13 17:00:39	11/13/13 17:59:39	1	a. Monitor equipment malfunction	Calibrated SO2	Calibrated SO2

Total Downtime in the Reporting Period = 34 hours , Data Availability for this Reporting Period = 98.46 %  
Total Operating Time in the Reporting Period = 2208 hours  
Report Printed on: 01/23/14 08:27:26

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Tail Gas Unit B

Parameter: SO2 CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/02/13 07:00:39	11/02/13 08:59:39	2	a. Monitor equipment malfunction	Probe box heater	Probe box heater
2	12/12/13 05:00:41	12/13/13 09:59:39	29	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
3	12/14/13 05:00:38	12/15/13 08:59:37	28	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
4	12/17/13 13:00:38	12/17/13 14:59:38	2	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
5	12/23/13 17:00:37	12/23/13 18:59:41	2	b. Non-monitor equipment malfunction	Hardware issue	Hardware issue
6	12/25/13 09:00:36	12/25/13 09:59:36	1	b. Non-monitor equipment malfunction	Hardware issue	Hardware issue
7	12/26/13 06:00:36	12/26/13 08:59:40	3	d. Other known cause	Calibrated analyzer	Calibrated analyzer

Total Downtime in the Reporting Period = 67 hours , Data Availability for this Reporting period = 95.57 %  
Total Operating Time in the Reporting Period = 1512 hours  
Report Printed on: 01/23/14 08:28:10

# Downtime Report

Location: Whiting Refinery

Facility Name: BP Products North America, Inc.

Source: Tail Gas Unit B

Parameter: CO CEMS

Data in the Reporting Period: 10/01/13 to 12/31/13

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/02/13 07:00:39	11/02/13 08:59:39	2	a. Monitor equipment malfunction	Probe box heater	Probe box heater
2	12/12/13 05:00:41	12/13/13 09:59:39	29	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
3	12/14/13 05:00:38	12/15/13 08:59:37	28	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
4	12/17/13 13:00:38	12/17/13 14:59:38	2	b. Non-monitor equipment malfunction	Regulator frozen	Regulator frozen
5	12/23/13 17:00:37	12/23/13 18:59:41	2	b. Non-monitor equipment malfunction	Hardware issue	Hardware issue
6	12/25/13 09:00:36	12/25/13 09:59:36	1	b. Non-monitor equipment malfunction	Hardware issue	Hardware issue
7	12/26/13 06:00:36	12/26/13 08:59:40	3	d. Other known cause	Calibrated analyzer	Calibrated analyzer

Total Downtime in the Reporting Period = 67 hours , Data Availability for this Reporting Period = 95.57 %  
Total Operating Time in the Reporting Period = 1512 hours  
Report Printed on: 01/23/14 08:28:06

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:08

Pollutant: NOx\_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/17/2013 14:00	10/17/2013 16:59	3	d. Other known cause	No sample pressure. Replaced pump, water washed sample line, changed ammonia scrubber.
10/19/2013 09:00	10/19/2013 13:59	5	d. Other known cause	No sample pressure after unit upset. Replaced pump, water washed sample line, changed ammonia scrubber.
10/24/2013 15:00	10/24/2013 15:59	1	a. Monitor equipment malfunction	Cleaned Process Equipment
11/03/2013 10:00	11/03/2013 11:59	2	a. Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 17:00	11/15/2013 17:59	1	a. Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 19:00	11/15/2013 22:59	4	a. Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 02:00	11/16/2013 04:59	3	a. Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 06:00	11/16/2013 16:59	11	a. Monitor equipment malfunction	Repaired Analyzer sample system
11/20/2013 09:00	11/20/2013 10:59	2	a. Monitor equipment malfunction	Re-installed original MLT analyzer
12/13/2013 16:00	12/13/2013 19:59	4	a. Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 36.0 Hours

## Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:08

Pollutant: CO\_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/17/2013 14:00	10/17/2013 16:59	3 d.	Other known cause	No sample pressure. Replaced pump, water washed sample line, changed ammonia scrubber.
10/19/2013 09:00	10/19/2013 13:59	5 d.	Other known cause	No sample pressure after unit upset. Replaced pump, water washed sample line, changed ammonia scrubber.
10/24/2013 15:00	10/24/2013 15:59	1 a.	Monitor equipment malfunction	Cleaned Process Equipment
11/03/2013 10:00	11/03/2013 11:59	2 a.	Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 17:00	11/15/2013 17:59	1 a.	Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 19:00	11/15/2013 22:59	4 a.	Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 02:00	11/16/2013 04:59	3 a.	Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 06:00	11/16/2013 16:59	11 a.	Monitor equipment malfunction	Repaired Analyzer sample system
11/20/2013 09:00	11/20/2013 10:59	2 a.	Monitor equipment malfunction	Re-installed original MLF analyzer
12/13/2013 16:00	12/13/2013 19:59	4 a.	Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 36.0 Hours

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 20:09

Pollutant: SO2\_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/17/2013 14:00	10/17/2013 16:59	3	d. Other known cause	No sample pressure. Replaced pump, water washed sample line, changed ammonia scrubber.
10/19/2013 09:00	10/19/2013 13:59	5	d. Other known cause	No sample pressure after unit upset. Replaced pump, water washed sample line, changed ammonia scrubber.
10/24/2013 15:00	10/24/2013 15:59	1	a. Monitor equipment malfunction	Cleaned Process Equipment
11/03/2013 10:00	11/03/2013 11:59	2	a. Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 17:00	11/15/2013 17:59	1	a. Monitor equipment malfunction	Cleaned Process Equipment
11/15/2013 19:00	11/15/2013 22:59	4	a. Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 02:00	11/16/2013 04:59	3	a. Monitor equipment malfunction	Cleaned Process Equipment
11/16/2013 06:00	11/16/2013 16:59	11	a. Monitor equipment malfunction	Repaired Analyzer sample system
11/20/2013 09:00	11/20/2013 10:59	2	a. Monitor equipment malfunction	Re-installed original MLT analyzer
12/13/2013 16:00	12/13/2013 18:59	3	a. Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 35.0 Hours

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 20:10

Pollutant: NOx\_6 Episode: 600 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/12/2013 14:00	11/12/2013 16:59	3	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/15/2013 14:00	11/15/2013 14:59	1	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/19/2013 09:00	11/19/2013 09:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/08/2013 09:00	12/09/2013 13:59	29	a. Monitor equipment malfunction	Recalibrated Analyzer(s)
12/11/2013 09:00	12/11/2013 09:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/13/2013 09:00	12/13/2013 15:59	7	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 02:00	12/17/2013 05:59	4	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 18:00	12/17/2013 19:59	2	a. Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time:

2208.0 Hours

TOTAL DURATION:

48.0 Hours

Episode List Report

BP Products North America, Inc  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 20:10

Pollutant: CO\_6 Episode: 600 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/12/2013 14:00	11/12/2013 16:59	3	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/15/2013 14:00	11/15/2013 14:59	1	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/19/2013 09:00	11/19/2013 09:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/08/2013 17:00	12/08/2013 17:59	1	b. Non-monitor equipment malfunction	Restarted PLC
12/09/2013 04:00	12/09/2013 13:59	10	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/11/2013 09:00	12/11/2013 09:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/13/2013 09:00	12/13/2013 15:59	7	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 02:00	12/17/2013 05:59	4	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 18:00	12/17/2013 19:59	2	a. Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 30.0 Hours

## Episode List Report

BP Products North America, Inc  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 20:09

Pollutant: SO2\_6 Episode: 600 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/11/2013 05:00	11/12/2013 16:59	36	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/15/2013 14:00	11/15/2013 14:59	1	a. Monitor equipment malfunction	Cleaned/repaired sample system.
11/19/2013 09:00	11/19/2013 09:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/08/2013 09:00	12/09/2013 13:59	29	a. Monitor equipment malfunction	Recalibrated Analyzer(s)
12/10/2013 05:00	12/11/2013 09:59	29	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/13/2013 09:00	12/13/2013 11:59	3	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/13/2013 12:00	12/13/2013 12:59	1	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/13/2013 13:00	12/13/2013 15:59	3	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 02:00	12/17/2013 05:59	4	a. Monitor equipment malfunction	Repaired Analyzer sample system
12/17/2013 18:00	12/17/2013 19:59	2	a. Monitor equipment malfunction	Repaired Analyzer sample system

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 109.0 Hours

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 19:35

Pollutant: NOx\_31 Episode: Unit 31 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/14/2013 12:00	10/14/2013 12:59	1	C. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 19:36

Pollutant: CO\_31 Episode: Unit 31 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/14/2013 12:00	10/14/2013 12:59	1	c. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 19:35

Pollutant: NOx\_32 Episode: Unit 32 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/14/2013 15:00	10/14/2013 15:59	1	d. Other known cause	CLD PM
10/16/2013 11:00	10/16/2013 11:59	1	c. Quality assurance calibration	CGA
10/21/2013 06:00	10/21/2013 07:59	2	d. Other known cause	Recalibrated Analyzer(s)

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 4.0 Hours

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/22/2014 19:36

Pollutant: CO\_32 Episode: Unit 32 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/14/2013 15:00	10/14/2013 15:59	1	d. Other known causes	CLD PM
10/16/2013 11:00	10/16/2013 11:59	1	c. Quality assurance calibration	CGA

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 2.0 Hours

Episode List Report

BP Products North America, Inc.

2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/22/2014 19:35

Pollutant: NOx\_33 Episode: Unit 33 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/06/2013 07:00	10/06/2013 07:59	1	c. Quality assurance calibration	CGA
11/13/2013 06:00	11/13/2013 07:59	2	d. Other known cause	Re-ran cal check / OK

Total Reported Time:

2166.0 Hours

TOTAL DURATION:

3.0 Hours

Episode List Report

BP Products North America, Inc.

2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/22/2014 19:36

Pollutant: CO\_33 Episode: Unit 33 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/06/2013 07:00	10/06/2013 07:59	1	c. Quality assurance calibration	CGA

Total Reported Time: 2166.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.

Whiting, IN 46394

from 10/1/2013 00:00 to 12/31/2013 23:59

Generated: : 1/22/2014 19:35

Pollutant: NOx\_34 Episode: Unit 34 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/05/2013 09:00	10/05/2013 09:59	1	c. Quality assurance calibration	CGA

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 19:36

Pollutant: CO\_34 Episode: Unit 34 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/05/2013 09:00	10/05/2013 09:59	1	c. Quality assurance calibration	CGA

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc.  
 2815 Indianapolis Blvd.  
 Whiting, IN 46394  
 from 10/1/2013 00:00 to 12/31/2013 23:59  
 Generated: : 1/22/2014 19:35

Pollutant: NOx\_36 Episode: Unit 36 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
12/05/2013 06:00	12/05/2013 09:59	4	d. Other known cause	Daily cal check failed. Recalibrated analyzer.

Total Reported Time: 1683.0 Hours

TOTAL DURATION: 4.0 Hours

## Episode List Report

BP Products North America, Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394  
from 10/1/2013 00:00 to 12/31/2013 23:59  
Generated: : 1/22/2014 19:36

Pollutant: CO\_36 Episode: Unit 36 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
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No Unit 36 CO Analyzer Downtime during the Report Period

## Attachment C

### Cylinder Gas Audit Results

**Including the following:**

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H <sub>2</sub> S	
CFU Fuel Drum	Total Sulfur	
CRU Fuel Drum	H <sub>2</sub> S	
CRU Fuel Drum	Total Sulfur	Not included in this report as this CEMS has not been installed.
4UF Fuel Drum	H <sub>2</sub> S	
4UF Fuel Drum	Total Sulfur	
#2 Coker Merox Treater Off-Gas	TS	Not included in this report because the unit started up, but has not been certified yet.
DDU Flare	H <sub>2</sub> S	
SRU Mix Fuel Drum	H <sub>2</sub> S	
SRU Mix Fuel Drum	Total Sulfur	
#2 Coker heater F-201	NO <sub>x</sub>	Not included in this report because the unit started up, but has not been certified yet.
#2 Coker heater F-201	CO	Not included in this report because the unit started up, but has not been certified yet.
#2 Coker heater F-202	NO <sub>x</sub>	Not included in this report because the unit started up, but has not been certified yet.
#2 Coker heater F-202	CO	Not included in this report because the unit started up, but has not been certified yet.
#2 Coker heater F-203	NO <sub>x</sub>	Not included in this report because the unit started up, but has not been certified yet.
#2 Coker heater F-203	CO	Not included in this report because the unit started up, but has not been certified yet.
12 PS heater H-101A	NO <sub>x</sub>	Not included because a RATA was performed during this quarter.
12 PS heater H-101A	CO	Not included because a RATA was performed during this quarter.
12 PS heater H-101B	NO <sub>x</sub>	Not included because a RATA was performed during this quarter.
12 PS heater H-101B	CO	Not included because a RATA was performed during this quarter.
12 PS heater H-102	NO <sub>x</sub>	Not included because a RATA was performed during this quarter.
12 PS heater H-102	CO	Not included because a RATA was performed during this quarter.
DHT heater B-601A	NO <sub>x</sub>	
DHT heater B-601A	CO	
GOHT Flare	H <sub>2</sub> S	Not included because a RATA was performed during this quarter.
GOHT Flare	Total Sulfur	Not included because a RATA was performed during this quarter.
South Flare	H <sub>2</sub> S	
South Flare	Total Sulfur	
B/S TGU	TRS	

Location/Emission Unit	Parameter	Notes
SBS TGU	SO <sub>2</sub>	
SRU Standby Incinerator	SO <sub>2</sub>	
COT1	CO	Not included in this report because the unit started up, but has not been certified yet.
COT1	SO <sub>2</sub>	Not included in this report because the unit started up, but has not been certified yet.
COT2	CO	Not included in this report because the unit started up, but has not been certified yet.
COT2	SO <sub>2</sub>	Not included in this report because the unit started up, but has not been certified yet.
FCU 500	NO <sub>x</sub>	
FCU 500	CO	
FCU 500	SO <sub>2</sub>	
FCU 600	NO <sub>x</sub>	
FCU 600	CO	
FCU 600	SO <sub>2</sub>	
3SPS Boiler 31 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 31 and Duct Burner 1	CO	
3SPS Boiler 32 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 32 and Duct Burner 2 <sup>2</sup>	CO	
3SPS Boiler 33 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 33 and Duct Burner 3 <sup>2</sup>	CO	
3SPS Boiler 34 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 34 and Duct Burner 4 <sup>2</sup>	CO	
3SPS Boiler 36 <sup>2</sup>	NO <sub>x</sub>	
3SPS Boiler 36 and Duct Burner 6 <sup>2</sup>	CO	

<sup>1</sup> The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

<sup>2</sup> The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

CFU H2S Audit Test Results Analyzer Span: 300.0 ppm

Mfr & Model: SIEMENS MAXUM

Serial Number: 001910

Low-Level Calibration Gas Concentration: 75.0  
(20-30% of Span) Cylinder No.: ALMO63153  
( 60.0 ppm - 90.0 ppm) Expiration Date: 03/26/16

Mid-Level Calibration Gas Concentration: 162.1  
(50-60% of Span) Cylinder No.: CC337713  
( 150.0 ppm - 180.0 ppm) Expiration Date: 10/22/16

Test Date: 12/17/13

Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	10:08:00	76.2	10:19:37	172.7
Run 2	10:32:53	76.7	10:44:29	172.7
Run 3	10:57:45	73.5	11:09:21	171.8
Avg. Monitor Response		75.5		172.4
Calibration Error		0.7		6.4
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor  
  
12-17-13

Joe Wulitich  
12-17-13

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

CFU TS Audit Test Results Analyzer Span: 400.0 ppm

Mfr & Model: SOLA 2

Serial Number: SL-07070111

Low-Level Calibration Gas  
(20-30% of Span)  
( 80.0 ppm - 120.0 ppm)

Concentration: 100.4  
Cylinder No.: CC409049  
Expiration Date: 08/21/15

Mid-Level Calibration Gas  
(50-60% of Span)  
( 200.0 ppm - 240.0 ppm)

Concentration: 217.9  
Cylinder No.: CC350000  
Expiration Date: 04/25/16

Test Date: 12/17/13

Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	11:06:37	105.7	11:12:23	218.0
Run 2	11:29:03	105.5	11:34:55	218.2
Run 3	11:49:27	106.6	11:55:19	218.4
Avg. Monitor Response		105.9		218.2
Calibration Error		5.5		0.1
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Analyzer Supervisor

*[Signature]*  
12-17-13

*Joe Wulitich*  
12-17-13

Company: Bp Products North America, Inc  
Plant: 2815 Indianapolis  
City/St: Whiting, IN 46394  
Source: stack\_cru

CGA Calibration Report  
Generated: 12/31/2013

Period Start: 12/31/2013  
Period End: 12/31/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

H2S\_CRU H2S 0.0 300.0 ppm H2S\_CRU H2S 0.0 300.0 ppm

Date		Time	From	Channel	Type	Target	Actual	Diff	Error	CGA Allowable	Bottle ID	Expire Date
12/31/2013	04:05			H2S_CRU	H2S	74.4	68.3	-6.1	-8.2	11.2	CC422103	11/12/2016
12/31/2013	04:05			H2S_CRU	H2S	157.2	153.7	-3.5	-2.2	23.6	CC329631	5/14/2016
12/31/2013	03:32			H2S_CRU	H2S	74.4	68.0	-6.4	-8.6	11.2	CC422103	11/12/2016
12/31/2013	03:32			H2S_CRU	H2S	157.2	153.6	-3.6	-2.3	23.6	CC329631	5/14/2016
12/31/2013	02:58			H2S_CRU	H2S	74.4	67.3	-7.1	-9.5	11.2	CC422103	11/12/2016
12/31/2013	02:58			H2S_CRU	H2S	157.2	152.9	-4.3	-2.7	23.6	CC329631	5/14/2016

FAIL - Difference Error > Regulations Allow  
TARG - Invalid Target (not within regulatory specs)  
RDG - Reading exceeds "Range of Analyzer"  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/(Target) \* 100

Channel		Diff	Target	Diff	Target
H2S_CRU	H2S	6.5	8.8%	3.8	2.4%

Performance Specification

Channel		FAIL
H2S_CRU	H2S	<=15.0%

Perf: (Part60 CGA H2S) Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: (Part60 CGA H2S) Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Date: 12/31/13

Date: 12/31/13

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

4UF TS Audit Test Results Analyzer Span: 400.0 ppm

Mfr & Model: SOLA 2

Serial Number: SL07070111

Low-Level Calibration Gas  
(20-30% of Span)  
( 80.0 ppm - 120.0 ppm)

Concentration: 100.8  
Cylinder No.: CC268194  
Expiration Date: 09/04/16

Mid-Level Calibration Gas  
(50-60% of Span)  
( 200.0 ppm - 240.0 ppm)

Concentration: 217.9  
Cylinder No.: CC360612  
Expiration Date: 04/25/16

Test Date: 12/26/13

Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	17:14:01	106.0	17:19:53	223.3
Run 2	17:43:10	106.0	17:49:02	223.9
Run 3	18:14:06	107.6	18:19:54	223.0
Avg. Monitor Response		106.5		223.4
Calibration Error		5.7		2.5
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

*Analyzer Sponsor*

*Aleksandra Boyen*

*12-27-13*

*Joe Wulitich*  
*12-26-13*

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

4UF H2S Audit Test Results Analyzer Span: 300.0 ppm

Mfr & Model: SIEMENS

Serial Number:

Low-Level Calibration Gas  
(20-30% of Span)  
( 60.0 ppm - 90.0 ppm)

Concentration: 75.8  
Cylinder No.: CC408957  
Expiration Date: 11/12/16

Mid-Level Calibration Gas  
(50-60% of Span)  
( 150.0 ppm - 180.0 ppm)

Concentration: 162.1  
Cylinder No.: CC343950  
Expiration Date: 10/22/16

Test Date: 12/19/13

Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	10:45:15	79.1	10:56:51	166.6
Run 2	11:10:07	78.1	11:21:47	168.4
Run 3	11:34:59	77.8	11:46:36	166.2
Avg. Monitor Response		78.3		167.1
Calibration Error		3.3		3.1
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Analyzer Supervisor



12-19-13

Joe Wulitich  
12-19-13

Babcock & Wilcox Power Generation Group NetDAHS®

CGA Calibration Report  
Generated: 12/4/2013

Company: BP Products North America, Inc  
Plant: 2015 Indianapolis  
City/State: Whiting, IN 46394  
Source: stack\_ddu  
Period Start: 12/4/2013  
Period End: 12/4/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:				Span of Analyzers:			
Date	Time	From	Channel	Target	Actual	Diff	CGA Allowable (40CFR60)
12/04/2013	19:03		H2S DDU	75.0	73.5	-1.5	15.0
12/04/2013	19:03		H2S DDU	157.2	157.4	0.2	23.6
12/04/2013	18:16		H2S DDU	75.0	73.1	-1.9	15.0
12/04/2013	18:16		H2S DDU	157.2	157.1	-0.1	23.6
12/04/2013	17:33		H2S DDU	75.0	72.5	-2.5	15.0
12/04/2013	17:33		H2S DDU	157.2	157.6	0.4	23.6

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel				Diff			
				Units			
				Target			
				Units			
H2S DDU	H2S	2.0	2.6%	0.2	0.1%		

Performance Specification

Channel	Performance Specification
H2S DDU	FAIL
H2S	<=15.0%
H2S	>15.0%

Perf: [Part60 CGA H2S] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA H2S] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Date: 12/4/13

Date: 12/4/13

Signature:

Signature:

Title: Analyst Supervisor

Period Start: 11/25/2013  
Period End: 11/25/2013  
Included Calibrations: CGA (40CFR60)

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis  
City/State: Whiting, IN 46394  
Source: stack.sru

CGA Calibration Report  
Generated: 11/25/2013

Range of Analyzers:						Span of Analyzers:					
Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expire Date
		3 pt.			Units	Units	Units		Units		
11/25/2013	13:04		H2S SRU	H2S	77.3	76.0	-1.3	-1.7	11.6	CG351424	7/22/2016
11/25/2013	13:04		H2S SRU	H2S	157.9	159.4	1.5	0.9	15.0	CG431417	5/1/2016
11/25/2013	12:29		H2S SRU	H2S	77.3	76.0	-1.3	-1.7	11.6	CG351424	7/22/2016
11/25/2013	12:29		H2S SRU	H2S	157.9	159.4	1.5	0.9	15.0	CG431417	5/1/2016
11/25/2013	11:52		H2S SRU	H2S	77.3	75.6	-1.7	-2.2	11.6	CG351424	7/22/2016
11/25/2013	11:52		H2S SRU	H2S	157.9	159.2	1.3	0.8	15.0	CG431417	5/1/2016

```

FAIL ~ Difference Error > Regulations Allow
TARG ~ Invalid target (not within regulatory specs)
RDG ~ Reading exceeds "Range of Analyzer"
@ Dottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

```

Absolute Average Bias and Absolute (Target - Average Reading) / Target, 100

Channel	Diff Units	Target Units	Diff Units	Target Units
225 SRU	4.25	1.4	1.58	1.4
				0.9%

### Performance Specification

Channel	PASS	FAIL
H2S SRU	100%	>15.0%

```
[part60 CGA H2S] Low = 15.0 &Target, Mid = 15.0 &Target, High = 15.0 &Target
[part60 CGA H2S] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
```

Perf:  
Altperf:

Date: 11/25/13

### Summary:

File: \_\_\_\_\_  
Title: Analgesic Supervisor

Date: 11, 25, 13

12/03/2015

Title: Archer Spenser

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT O2 Audit Test Results Analyzer Span: 25.00 %

Low-Level Calibration Gas Concentration: 5.03  
(4.00% - 6.00%) Cylinder No.: CC200407  
Expiration Date: 05/09/15

Mid-Level Calibration Gas Concentration: 11.01  
(8.00% - 12.00%) Cylinder No.: CC58808  
Expiration Date: 05/09/15

Test Date: 11/26/13

Tester: JW

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	12:29:07	5.10	0.07	1.4	12:31:51	11.14	0.13	1.2
Run 2	12:45:43	5.09	0.06	1.2	12:48:26	11.13	0.12	1.1
Run 3	13:02:56	5.07	0.04	0.8	13:05:40	11.14	0.13	1.2
Avg. Monitor Response		5.09				11.14		
Reference/Target		5.03				11.01		
Absolute Difference			0.06				0.13	
% Calibration Error				1.2				1.2
Performance Specification				15.0 %				15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Bill Hugel  
11/26/13

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT CO Low Audit Test Results Analyzer Span: 100.00 ppm

Low-Level Calibration Gas Concentration: 25.34  
(20-30% of Span) Cylinder No.: CC200407  
( 20.00 ppm - 30.00 ppm) Expiration Date: 05/09/15

Mid-Level Calibration Gas Concentration: 54.50  
(50-60% of Span) Cylinder No.: CC58808  
( 50.00 ppm - 60.00 ppm) Expiration Date: 05/09/15

Test Date: 11/26/13

Tester: JW

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	12:29:07	22.20	3.14	-12.4	12:31:51	50.30	4.20	-7.7
Run 2	12:45:43	22.10	3.24	-12.8	12:48:26	50.20	4.30	-7.9
Run 3	13:02:56	21.90	3.44	-13.6	13:05:40	50.10	4.40	-8.1
Avg. Monitor Response		22.07				50.20		
Reference/Target		25.34				54.50		
Absolute Difference			3.27				4.30	
% Calibration Error				-12.9				-7.9
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Bill Hough  
11/26/13

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT CO High Audit Test Results Analyzer Span: 5000.0 ppm

Low-Level Calibration Gas Concentration: 1269.0  
(20-30% of Span) Cylinder No.: CC140211  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 07/18/14

Mid-Level Calibration Gas Concentration: 2819.0  
(50-60% of Span) Cylinder No.: CC114328  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 07/18/15

Test Date: 11/26/13

Tester: JW

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	12:34:35	1300.0	31.0	2.4	12:37:15	2864.4	45.4	1.6
Run 2	12:51:10	1297.5	28.5	2.2	12:53:50	2864.1	45.1	1.6
Run 3	13:08:24	1297.5	28.5	2.2	13:11:08	2865.0	46.0	1.6
Avg. Monitor Response		1298.3				2864.5		
Reference/Target		1269.0				2819.0		
Absolute Difference			29.3				45.5	
% Calibration Error				2.3				1.6
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Bill Hughes  
11/26/13

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

DHT NOx Audit Test Results Analyzer Span: 100.00 ppm

Low-Level Calibration Gas Concentration: 25.45  
(20-30% of Span) Cylinder No.: CC140211  
( 20.00 ppm - 30.00 ppm) Expiration Date: 07/18/14

Mid-Level Calibration Gas Concentration: 54.55  
(50-60% of Span) Cylinder No.: CC114328  
( 50.00 ppm - 60.00 ppm) Expiration Date: 07/18/15

Test Date: 11/26/13

Tester: JW

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run 1	12:34:35	24.60	0.85	-3.3	12:37:15	53.40	1.15	-2.1
Run 2	12:51:10	24.70	0.75	-2.9	12:53:50	53.20	1.35	-2.5
Run 3	13:08:24	24.60	0.85	-3.3	13:11:08	53.20	1.35	-2.5
Avg. Monitor Response		24.63				53.27		
Reference/Target		25.45				54.55		
Absolute Difference			0.82				1.28	
% Calibration Error				-3.2				-2.3
Performance Specification			5.00 ppm	15.0 %			5.00 ppm	15.0 %
Test Status	Pass				Pass			

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration}}{\text{Cal. Gas Concentration}} \times 100$$

Bill Hugh  
11/26/13

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

SF TS Low Audit Test Results Analyzer Span: 5000.0 ppm

Mfr & Model: THERMO FISHER SCIENTIFIC

Serial Number: SL-07990512

Low-Level Calibration Gas Concentration: 1257.000  
(20-30% of Span) Cylinder No.: CC416821  
( 1000.0 ppm - 1500.0 ppm) Expiration Date: 10/09/15

Mid-Level Calibration Gas Concentration: 2767.000  
(50-60% of Span) Cylinder No.: CC416805  
( 2500.0 ppm - 3000.0 ppm) Expiration Date: 10/08/15

Test Date: 12/31/13

Tester: RM, CC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	12:32:15	1235.000	12:38:03	2825.000
Run 2	12:48:26	1178.000	12:54:19	2550.000
Run 3	13:05:11	1160.000	13:11:03	2521.000
Avg. Monitor Response		1191.000		2632.000
Calibration Error		-5.300		-4.900
Absolute Difference		66.000		135.000
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Bill Hughes 1/2/14  
Ramón Marquig 1/2/14

# CGA Test Report - 2013Q4

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

SF TS High Audit Test Results Analyzer Span: 500000 ppm

Mfr & Model: THERMO FISHER SCIENTIFIC

Serial Number: SL-07990512

Low-Level Calibration Gas  
(20-30% of Span)  
( 100000 ppm - 150000

Concentration: 124900.00  
Cylinder No.: TW08595672  
Expiration Date: 06/20/14

Mid-Level Calibration Gas  
(50-60% of Span)  
( 250000 ppm - 300000

Concentration: 274900.00  
Cylinder No.: 4084293Y  
Expiration Date: 04/19/14

Test Date: 12/31/13

Tester: RM, CC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run 1	13:57:50	130031.00	14:03:39	280500.00
Run 2	14:17:43	129281.00	14:23:35	282875.00
Run 3	14:36:23	127063.00	14:42:11	273656.00
Avg. Monitor Response		128792.00		279010.00
Calibration Error		3.100		1.500
Absolute Difference		3892.00		4110.00
Test Status		Pass		Pass

$$\text{Calibration Error} = \frac{\text{Avg. Monitor Response} - \text{Cal. Gas Concentration} \times 100}{\text{Cal. Gas Concentration}}$$

Bill Hight 1/2/14  
Barmer Mönique 1/2/14

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

CGA Calibration Report  
Generated: 10/7/2013

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis Blvd.  
City: Whitening, IN 46394  
Source: 45

Period Start: 10/7/2013  
Period End: 10/7/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

Span of Analyzers:

O2_5	10.00 %O2	O2_5	0.00	O2	10.00 %O2
CO_5	1000.0 ppm	CO_5	0.0	CO	1000.0 ppm
NOx_5	160.0 ppm	NOx_5	0.0	NOx	160.0 ppm
SO2_5	100.0 ppm	SO2_5	0.0	SO2	100.0 ppm
CO2_5	30.00 %CO2	CO2_5	0.00	CO2	30.00 %CO2

Date	Time	From	Channel	Type	Target		Actual		Diff		CGA Allowable (40CFR60)		Bottle ID	Expire Date
					Units		Units		Units		Units			
10/07/2013	09:28	CO_5	CO_5	LOW	251.60	246.80	-4.80	-1.9	37.74	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	09:28		CO_5	MID	555.10	543.80	-11.30	-2.0	83.26	15.0	PASS	cc182925	5/14/2015	
10/07/2013	08:54		CO_5	LOW	251.60	246.80	-4.80	-1.9	37.74	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	08:54		CO_5	MID	555.10	543.60	-11.50	-2.1	83.26	15.0	PASS	cc182925	5/14/2015	
10/07/2013	08:22	CO_5	CO_5	LOW	251.60	246.80	-4.80	-1.9	37.74	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	08:22		CO_5	MID	555.10	544.00	-11.10	-2.0	83.26	15.0	PASS	cc182925	5/14/2015	
10/07/2013	09:28		CO2_5	LOW	7.57	6.71	-0.86	-11.4	1.14	15.0	PASS	cc186409	1/30/2014	
10/07/2013	09:28		CO2_5	MID	16.36	16.00	-0.36	-2.2	2.45	15.0	PASS	xc018790b	11/2/2013	
10/07/2013	08:54	CO2_5	CO2_5	LOW	7.57	6.71	-0.86	-11.4	1.14	15.0	PASS	cc186409	1/30/2014	
10/07/2013	08:54		CO2_5	MID	16.36	15.99	-0.37	-2.3	2.45	15.0	PASS	xc018790b	11/2/2013	
10/07/2013	08:22		CO2_5	LOW	7.57	6.69	-0.88	-11.6	1.14	15.0	PASS	cc186409	1/30/2014	
10/07/2013	08:22		CO2_5	MID	16.36	15.96	-0.40	-2.4	2.45	15.0	PASS	xc018790b	11/2/2013	
10/07/2013	09:28	NOx_5	NOx_5	LOW	40.30	43.00	2.70	6.7	6.05	15.0	PASS	cc186409	1/30/2014	
10/07/2013	09:28		NOx_5	MID	87.60	91.70	4.10	4.7	13.14	15.0	PASS	cc018790b	11/2/2013	
10/07/2013	08:54		NOx_5	LOW	40.30	43.10	2.80	6.9	6.05	15.0	PASS	cc186409	1/30/2014	
10/07/2013	08:54		NOx_5	MID	87.60	91.70	4.10	4.7	13.14	15.0	PASS	cc018790b	11/2/2013	
10/07/2013	08:22	NOx_5	NOx_5	LOW	40.30	43.10	2.80	6.9	6.05	15.0	PASS	cc186409	1/30/2014	
10/07/2013	08:22		NOx_5	MID	87.60	91.70	4.10	4.7	13.14	15.0	PASS	cc018790b	11/2/2013	
10/07/2013	09:28		O2_5	LOW	5.02	5.15	0.13	2.6	0.75	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	09:28		O2_5	MID	9.04	9.13	0.09	1.0	1.36	15.0	PASS	cc182925	5/14/2015	
10/07/2013	08:54	O2_5	O2_5	LOW	5.02	5.14	0.12	2.4	0.75	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	08:54		O2_5	MID	9.04	9.12	0.08	0.9	1.36	15.0	PASS	cc182925	5/14/2015	
10/07/2013	08:22		O2_5	LOW	5.02	5.15	0.13	2.6	0.75	15.0	PASS	xc005499b	5/14/2015	
10/07/2013	08:22		O2_5	MID	9.04	9.13	0.09	1.0	1.36	15.0	PASS	cc182925	5/14/2015	
10/07/2013	09:28	SO2_5	SO2_5	LOW	25.00	26.70	1.70	6.8	3.75	15.0	PASS	cc186409	1/30/2014	
10/07/2013	09:28		SO2_5	MID	56.90	59.20	2.30	4.0	8.54	15.0	PASS	xc018790b	11/2/2013	

Company: BP Products North America, Inc  
 Plant: 2815 Indianapolis Blvd.  
 City/St: Whiting, IN 46394  
 Source: US

CGA Calibration Report  
 Generated: 10/7/2013

Period Start: 10/7/2013  
 Period End: 10/7/2013  
 Included Calibrations: CGA (40CFR60)

Date	Time	From	3 Pt.	Channel	Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	Pass	Bottle ID	Expire Date
10/07/2013	08:54			SO2_5	SO2	25.00	26.50	1.50	6.0	3.75	15.0	cc186409	1/30/2014
10/07/2013	08:54			SO2_5	SO2	56.90	59.10	2.20	3.9	8.54	15.0	xc018790b	11/2/2013
10/07/2013	08:22			SO2_5	SO2	25.00	26.50	1.50	6.0	3.75	15.0	cc186409	1/30/2014
10/07/2013	08:22			SO2_5	SO2	56.90	59.00	2.10	3.7	8.54	15.0	xc018790b	11/2/2013

FAIL = Difference Error > Regulations Allow  
 TARG = Invalid Target (not within regulatory specs)  
 RDG = Reading exceeds "Range of Analyzer"  
 @ Bottle is within 7 days of expiration  
 # Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

		---LOW---		---MID---	
Channel	Target	Diff	Target	Diff	Target
CO_5	4.80	1.9%	11.30	2.0%	
CO2_5	0.87	11.4%	0.38	2.3%	
NOx_5	2.77	6.9%	4.10	4.7%	
O2_5	0.13	2.5%	0.09	1.0%	
SO2_5	1.57	6.3%	2.20	3.9%	

#### Performance Specification

Channel	Target	Diff	Target	Diff	Target
CO_5	4.80	1.9%	11.30	2.0%	
CO2_5	0.87	11.4%	0.38	2.3%	
NOx_5	2.77	6.9%	4.10	4.7%	
O2_5	0.13	2.5%	0.09	1.0%	
SO2_5	1.57	6.3%	2.20	3.9%	

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
 AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
 Perf: [Part60 CGA CO2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
 AltPerf: [Part60 CGA CO2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
 Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
 AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
 Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
 AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
 Perf: [Part60 CGA SO2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
 AltPerf: [Part60 CGA SO2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Signature: *Chris Pothart* Date: 10/7/13

Title: Signature: *Bill Hyler* Date: 10/7/13

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

CGA Calibration Report  
Generated: 11/26/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: u6

Period Start: 11/26/2013  
Period End: 11/26/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

Span of Analyzers:

Date	Time	From	Channel	Range of Analyzers		Target	Actual	Diff	Error %	CGA Allowable (40CFR60)		Bottle ID	Expiry Date
				Type	Units	Units	Units	Units	Units	Units	%		
11/26/2013	11:04	CO_6	CO_6	CO	LOW	253.8	251.9	-1.9	-0.7	38.1	15.0	CC95915	5/14/2015
11/26/2013	11:04	CO_6	CO_6	CO	MID	555.0	552.2	-2.8	-0.5	83.3	15.0	CC287097	5/14/2015
11/26/2013	10:29	CO_6	CO_6	CO	LOW	253.8	251.6	-2.2	-0.9	38.1	15.0	CC95915	5/14/2015
11/26/2013	10:29	CO_6	CO_6	CO	MID	555.0	552.0	-3.0	-0.5	83.3	15.0	CC287097	5/14/2015
11/26/2013	09:57	CO_6	CO_6	CO	LOW	253.8	251.7	-2.1	-0.8	38.1	15.0	CC95915	5/14/2015
11/26/2013	09:57	CO_6	CO_6	CO	MID	555.0	552.0	-3.0	-0.5	83.3	15.0	CC287097	5/14/2015
11/26/2013	11:04	CO2_6	CO2_6	CO2	LOW	7.5	6.6	-0.9	-12.5	1.1	15.0	CC206521	4/16/2016
11/26/2013	11:04	CO2_6	CO2_6	CO2	MID	16.4	15.8	-0.6	-3.8	2.5	15.0	CC179076	4/16/2016
11/26/2013	10:29	CO2_6	CO2_6	CO2	LOW	7.5	6.6	-0.9	-12.7	1.1	15.0	CC206521	4/16/2016
11/26/2013	10:29	CO2_6	CO2_6	CO2	MID	16.4	15.8	-0.6	-4.0	2.5	15.0	CC179076	4/16/2016
11/26/2013	09:57	CO2_6	CO2_6	CO2	LOW	7.5	6.6	-0.9	-12.6	1.1	15.0	CC179076	4/16/2016
11/26/2013	09:57	CO2_6	CO2_6	CO2	MID	16.4	15.8	-0.6	-3.9	2.5	15.0	CC206521	4/16/2016
11/26/2013	11:04	NOx_6	NOx_6	NOx	LOW	19.5	21.1	1.6	8.2	2.9	15.0	CC179076	4/16/2016
11/26/2013	11:04	NOx_6	NOx_6	NOx	MID	43.9	46.3	2.4	5.5	6.6	15.0	CC179076	4/16/2016
11/26/2013	10:29	NOx_6	NOx_6	NOx	LOW	19.5	21.0	1.5	7.7	2.9	15.0	CC206521	4/16/2016
11/26/2013	10:29	NOx_6	NOx_6	NOx	MID	43.9	46.3	2.4	5.5	6.6	15.0	CC179076	4/16/2016
11/26/2013	09:57	NOx_6	NOx_6	NOx	LOW	19.5	21.0	1.5	7.7	2.9	15.0	CC206521	4/16/2016
11/26/2013	09:57	NOx_6	NOx_6	NOx	MID	43.9	46.2	2.3	5.2	6.6	15.0	CC179076	4/16/2016
11/26/2013	11:04	O2_6	O2_6	O2	LOW	5.0	4.9	-0.1	-1.6	0.8	15.0	CC95915	5/14/2015
11/26/2013	11:04	O2_6	O2_6	O2	MID	9.0	8.9	-0.1	-1.0	1.3	15.0	CC287097	5/14/2015
11/26/2013	10:29	O2_6	O2_6	O2	LOW	5.0	4.9	-0.1	-1.6	0.8	15.0	CC95915	5/14/2015
11/26/2013	10:29	O2_6	O2_6	O2	MID	9.0	8.9	-0.1	-1.0	1.3	15.0	CC287097	5/14/2015
11/26/2013	09:57	O2_6	O2_6	O2	LOW	5.0	4.9	-0.1	-1.6	0.8	15.0	CC95915	5/14/2015
11/26/2013	09:57	O2_6	O2_6	O2	MID	9.0	8.9	-0.1	-1.0	1.3	15.0	CC287097	5/14/2015
11/26/2013	11:04	SO2_6	SO2_6	SO2	LOW	24.8	25.5	0.7	2.8	3.7	15.0	CC206521	4/16/2016
11/26/2013	11:04	SO2_6	SO2_6	SO2	MID	56.6	55.5	-1.1	-1.9	8.5	15.0	CC179076	4/16/2016

CGA Calibration Report  
Generated: 11/26/2013

Company: BP Products North America, Inc  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: u6

Period Start: 11/26/2013  
Period End: 11/26/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expire Date
11/26/2013	10:29	3 Pt.	SO2_6	LOW	24.8	24.4	-0.4	-1.6	3.7	CC206521	4/16/2016
11/26/2013	10:29		SO2_6	MID	56.6	55.3	-1.3	-2.3	8.5	CC179076	4/15/2016
11/26/2013	09:57		SO2_6	LOW	24.8	24.4	-0.4	-1.6	3.7	CC206521	4/16/2016
11/26/2013	09:57		SO2_6	MID	56.6	56.3	-0.3	-0.5	8.5	CC179076	4/15/2016

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDC = Reading exceeds "Range of Analyzer"  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff	Target	Diff	Target
CO_6	2.1	0.8%	2.9	0.5%
CO2_6	1.0	12.6%	0.6	3.9%
NOx_6	1.5	7.9%	2.4	5.4%
O2_6	0.1	1.6%	0.1	1.0%
SO2_6	0.0	0.1%	0.9	1.6%

Performance Specification

Channel	Diff	Target	Diff	Target
CO_6	2.1	0.8%	2.9	0.5%
CO2_6	1.0	12.6%	0.6	3.9%
NOx_6	1.5	7.9%	2.4	5.4%
O2_6	0.1	1.6%	0.1	1.0%
SO2_6	0.0	0.1%	0.9	1.6%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Signature: Date: 11/26/13

Title: Analyzer Supervisor Signature: Date: 11/26/13

Babcock & Wilcox Power Generation Group NetDAHQ

Version 84.0

CGA Calibration Report  
Generated: 10/16/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/14/2013  
Period End: 10/14/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:										Span of Analyzers:									
Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expire Date								
10/14/2013	12:51	3 Pt.	CO	LOW	1238.0	1201.0	-37.0	-3.0	185.7	CC208311	5/15/2014								
10/14/2013	12:51	*	COHigh_31	CO	2806.0	2736.0	-70.0	-2.5	420.9	PASS	CC364299								
10/14/2013	12:51	*	COHigh_31	CO	1238.0	1203.0	-35.0	-2.8	185.7	PASS	CC208311								
10/14/2013	12:03	*	COHigh_31	CO	2806.0	2741.0	-65.0	-2.3	420.9	PASS	CC364299								
10/14/2013	12:03	*	COHigh_31	CO	1238.0	1203.0	-35.0	-2.8	185.7	PASS	CC208311								
10/14/2013	11:22	*	COHigh_31	CO	2806.0	2744.0	-62.0	-2.2	420.9	PASS	CC364299								
10/14/2013	11:22	*	COHigh_31	CO	2806.0	2744.0	-62.0	-2.2	420.9	PASS	CC364299								
10/14/2013	12:51	*	COLow_31	CO	25.2	25.0	-0.2	-0.6	3.8	PASS	CC432333								
10/14/2013	12:51	*	COLow_31	CO	55.6	55.2	-0.4	-0.7	8.3	PASS	CC432333								
10/14/2013	12:03	*	COLow_31	CO	25.2	25.0	-0.2	-0.8	3.8	PASS	CC432333								
10/14/2013	12:03	*	COLow_31	CO	55.6	55.3	-0.3	-0.6	8.3	PASS	CC432333								
10/14/2013	11:22	*	COLow_31	CO	25.2	24.8	-0.3	-1.3	3.8	PASS	CC432333								
10/14/2013	11:22	*	COLow_31	CO	55.6	55.2	-0.5	-0.8	8.3	PASS	CC432333								
10/14/2013	12:51	*	NOxHigh_31	NOx	181.4	182.6	1.2	0.7	27.2	PASS	CC364233								
10/14/2013	12:51	*	NOxHigh_31	NOx	391.2	390.1	-1.1	-0.3	58.7	PASS	CC331503								
10/14/2013	12:03	*	NOxHigh_31	NOx	181.4	182.9	1.5	0.8	27.2	PASS	CC364233								
10/14/2013	12:03	*	NOxHigh_31	NOx	391.2	389.6	-1.6	-0.4	58.7	PASS	CC331503								
10/14/2013	11:22	*	NOxHigh_31	NOx	181.4	182.7	1.3	0.7	27.2	PASS	CC364233								
10/14/2013	11:22	*	NOxHigh_31	NOx	391.2	389.8	-1.4	-0.4	58.7	PASS	CC331503								
10/14/2013	12:51	*	NOxLow_31	NOx	13.0	12.8	-0.2	-1.6	1.9	PASS	CC208311								
10/14/2013	12:51	*	NOxLow_31	NOx	27.6	27.6	0.0	0.0	4.1	PASS	CC364299								
10/14/2013	12:03	*	NOxLow_31	NOx	13.0	12.8	-0.2	-1.5	1.9	PASS	CC208311								
10/14/2013	12:03	*	NOxLow_31	NOx	27.6	27.6	0.0	0.0	4.1	PASS	CC364299								
10/14/2013	11:22	*	NOxLow_31	NOx	13.0	12.8	-0.2	-1.4	1.9	PASS	CC208311								
10/14/2013	11:22	*	NOxLow_31	NOx	27.6	27.6	0.0	0.1	4.1	PASS	CC364299								
10/14/2013	12:51	*	O2_31	O2	6.2	6.3	0.1	1.3	0.9	PASS	CC432333								
10/14/2013	12:51	*	O2_31	O2	13.8	13.9	0.1	0.8	2.1	PASS	CC332261								

CGA Calibration Report  
Generated: 10/16/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/14/2013  
Period End: 10/14/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	Bottle ID	Expire Date
10/14/2013	12:03	*	G2_31	O2	6.2	6.3	0.1	1.4	0.9	CC432333	8/26/2021
10/14/2013	12:03	*	O2_31	O2	13.8	13.9	0.1	0.9	2.1	CC332261	10/6/2018
10/14/2013	11:22	*	O2_31	O2	6.2	6.3	0.1	1.4	0.9	CC432333	8/26/2021
10/14/2013	11:22	*	O2_31	O2	13.8	13.9	0.1	1.0	2.1	CC332261	10/6/2018

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDS = Reading exceeds "Range of Analyzer"  
# Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff Units	Target %	Diff Units	Target %
COHigh_31	35.7	2.9%	65.7	2.3%
COLow_31	0.2	0.9%	0.4	0.7%
NOxHigh_31	1.3	0.7%	1.4	0.3%
NOxLow_31	0.2	1.5%	0.0	0.0%
O2_31	0.1	1.4%	0.1	0.9%

Performance Specification

Channel	Pass	Fail
COHigh_31	CO <=15.0%	>15.0%
COLow_31	CO <=15.0%	>15.0%
NOxHigh_31	NOx <=15.0%	>15.0%
NOxLow_31	NOx <=15.0%	>15.0%
O2_31	O2 <=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: TECH Signature: L- Smith (well) Date: 10/17/13

Title: Supv Signature: Bill Flynn Date: 10/16/13

Linearity Calibration Report  
Generated: 10/16/2013

Period Start: 10/14/2013  
Period End: 10/14/2013  
Included Calibrations: Linearity (40CFR75)

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: Slack

Range of Analyzers:

Span of Analyzers:

O2_31	O2	0.00	25.00 %O2	O2_31	O2	0.00	25.00 %O2
NOxLow_31	NOx	0.00	50.00 ppm	NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm	NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Bottle ID	Expire Date
10/14/2013	12:51	NOxHigh_31	NOx	181.400	182.600	1.200	0.7	9.070	CC364233	1/13/2014
10/14/2013	12:51	NOxHigh_31	NOx	391.200	390.100	-1.100	-0.3	19.560	CC331503	5/15/2014
10/14/2013	12:51	NOxHigh_31	NOx	637.700	612.600	-25.100	-3.9	31.885	SG9168086BAL	8/23/2021
10/14/2013	12:03	NOxHigh_31	NOx	181.400	182.900	1.500	0.8	9.070	CC364233	1/13/2014
10/14/2013	12:03	NOxHigh_31	NOx	391.200	389.600	-1.600	-0.4	19.560	CC331503	5/15/2014
10/14/2013	12:03	NOxHigh_31	NOx	637.700	613.000	-24.700	-3.9	31.885	SG9168086BAL	8/23/2021
10/14/2013	12:03	NOxHigh_31	NOx	181.400	182.700	1.300	0.7	9.070	CC364233	1/13/2014
10/14/2013	11:22	NOxHigh_31	NOx	391.200	389.800	-1.400	-0.4	19.560	CC331503	5/15/2014
10/14/2013	11:22	NOxHigh_31	NOx	637.700	612.800	-24.900	-3.9	31.885	SG9168086BAL	8/23/2021
10/14/2013	12:51	NOxLow_31	NOx	12.990	12.780	-0.210	-1.5	0.650	CC208311	5/15/2014
10/14/2013	12:51	NOxLow_31	NOx	27.590	27.580	-0.010	0.0	1.380	CC364299	1/19/2014
10/14/2013	12:51	NOxLow_31	NOx	46.070	45.810	-0.260	-0.7	2.303	CC322884	8/5/2016
10/14/2013	12:03	NOxLow_31	NOx	12.990	12.800	-0.190	-1.5	0.650	CC208311	5/15/2014
10/14/2013	12:03	NOxLow_31	NOx	27.590	27.580	-0.010	0.0	1.380	CC364299	1/19/2014
10/14/2013	12:03	NOxLow_31	NOx	46.070	45.890	-0.180	-0.4	2.303	CC322884	8/5/2016
10/14/2013	11:22	NOxLow_31	NOx	12.990	12.810	-0.180	-1.5	0.650	CC208311	5/15/2014
10/14/2013	11:22	NOxLow_31	NOx	27.590	27.620	0.030	0.0	1.380	CC364299	1/19/2014
10/14/2013	11:22	NOxLow_31	NOx	46.070	45.870	-0.200	-0.4	2.303	CC322884	8/5/2016
10/14/2013	12:51	O2_31	O2	6.210	6.290	0.080	1.6	0.310	CC432333	8/26/2021
10/14/2013	12:51	O2_31	O2	13.760	13.870	0.110	0.7	0.688	CC432361	10/6/2018
10/14/2013	12:51	O2_31	O2	21.030	21.250	0.220	1.0	1.052	CC409778	7/25/2021
10/14/2013	12:03	O2_31	O2	6.210	6.300	0.090	1.6	0.310	CC432333	8/26/2021
10/14/2013	12:03	O2_31	O2	13.760	13.890	0.130	0.7	0.688	CC432361	10/6/2018
10/14/2013	12:03	O2_31	O2	21.030	21.270	0.240	1.0	1.052	CC409778	7/25/2021
10/14/2013	11:22	O2_31	O2	6.210	6.300	0.090	1.6	0.310	CC432333	8/26/2021
10/14/2013	11:22	O2_31	O2	13.760	13.900	0.140	0.7	0.688	CC432361	10/6/2018
10/14/2013	11:22	O2_31	O2	21.030	21.290	0.260	1.4	1.052	CC409778	7/25/2021

FAIL = Difference Error > Regulations Allow

TARG = Invalid Target (not within regulatory specs)

RDG = Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/14/2013  
Period End: 10/14/2013  
Included Calibrations: Linearity (40CFR75)

Linearity Calibration Report  
Generated: 10/16/2013

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) \* 100

Channel	---LOW---		---MID---		---HIGH---	
	Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
NOxHigh_31	1.333	0.7%	1.367	0.3%	24.900	3.9%
NOxLow_31	0.193	1.5%	0.003	0.0%	0.213	0.5%
O2_31	0.087	1.4%	0.127	0.9%	0.240	1.1%

Performance Specification

Channel	PASS	FAIL
NOxHigh_31	NOx <=5.0%	>5.0%
NOxLow_31	NOx <=5.0%	>5.0%
O2_31	O2 <=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Tech Signature: L. Smith Date: 10/17/13  
Title: Surv Signature: Bill Hylch Date: 10/16/13

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

CGA Calibration Report  
Generated: 10/16/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/1/2013  
Period End: 10/16/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

Span of Analyzers:

Date	Time	3 Pt.	From	Channel	Type	Range of Analyzers				Span of Analyzers				Actual Units	Diff Units	Error %	CGA Allowable (40CFR60)		Bottle ID	Expire Date
						Target Units	O2	CO	25.00 %O2	O2_32	CO_32	CO	25.00 %O2				Units	%		
10/16/2013	11:37	*	*	COHigh_32	CO	1234.00	0.00	0.00	100.00 ppm	COHigh_32	CO	0.00	100.00 ppm	1184.00	-94.00	-4.4	185.70	15.0	CG204311	5/15/2014
10/16/2013	11:37	*	*	COHigh_32	CO	2806.00	0.00	0.00	100.00 ppm	COHigh_32	CO	0.00	100.00 ppm	2700.00	-106.00	-3.8	420.90	15.0	CG364299	1/19/2014
10/16/2013	10:46	*	*	COHigh_32	CO	1238.00	0.00	0.00	5000 ppm	COHigh_32	CO	0	5000 ppm	1184.00	-54.00	-4.4	185.70	15.0	CG208311	5/15/2014
10/16/2013	10:46	*	*	COHigh_32	CO	2806.00	0.00	0.00	5000 ppm	COHigh_32	CO	0	5000 ppm	2701.00	-105.00	-3.7	420.90	15.0	CG364299	1/19/2014
10/16/2013	09:16	*	*	COHigh_32	CO	1238.00	0.00	0.00	700.0 ppm	NOxLow_32	NOx	0.00	700.0 ppm	1184.00	-54.00	-4.4	185.70	15.0	CG208311	5/15/2014
10/16/2013	09:16	*	*	COHigh_32	CO	2806.00	0.00	0.00	700.0 ppm	NOxHigh_32	NOx	0.0	700.0 ppm	2702.00	-104.00	-3.7	420.90	15.0	CG364299	1/19/2014
10/16/2013	11:37	*	*	COHigh_32	CO	25.17	0.00	0.00	25.17	COHigh_32	CO	0.00	25.17	23.61	-1.56	-6.2	3.78	15.0	CG432333	8/26/2021
10/16/2013	11:37	*	*	COHigh_32	CO	56.00	0.00	0.00	56.00	COHigh_32	CO	0.00	56.00	54.33	-1.67	-3.0	8.40	15.0	CG107578	3/1/2021
10/16/2013	10:46	*	*	COHigh_32	CO	25.17	0.00	0.00	25.17	COHigh_32	CO	0.00	25.17	23.76	-1.41	-5.6	3.78	15.0	CG432333	8/26/2021
10/16/2013	10:46	*	*	COHigh_32	CO	56.00	0.00	0.00	56.00	COHigh_32	CO	0.00	56.00	54.44	-1.56	-2.8	6.40	15.0	CG107578	3/1/2021
10/16/2013	09:16	*	*	COHigh_32	CO	25.17	0.00	0.00	25.17	COHigh_32	CO	0.00	25.17	24.00	-1.17	-4.6	3.78	15.0	CG432333	8/26/2021
10/16/2013	09:16	*	*	COHigh_32	CO	56.00	0.00	0.00	56.00	COHigh_32	CO	0.00	56.00	54.65	-1.35	-2.4	8.40	15.0	CG107578	3/1/2021
10/16/2013	11:37	*	*	NOxHigh_32	NOx	181.40	0.00	0.00	181.40	NOxHigh_32	NOx	0.00	181.40	181.00	-0.40	-0.2	27.21	15.0	CG364233	1/13/2014
10/16/2013	11:37	*	*	NOxHigh_32	NOx	391.20	0.00	0.00	391.20	NOxHigh_32	NOx	0.00	391.20	394.20	3.00	0.8	58.68	15.0	CG331503	5/15/2014
10/16/2013	10:46	*	*	NOxHigh_32	NOx	181.40	0.00	0.00	181.40	NOxHigh_32	NOx	0.00	181.40	180.80	-0.60	-0.3	27.21	15.0	CG364233	1/13/2014
10/16/2013	10:46	*	*	NOxHigh_32	NOx	391.20	0.00	0.00	391.20	NOxHigh_32	NOx	0.00	391.20	393.80	2.60	0.7	58.68	15.0	CG331503	5/15/2014
10/16/2013	09:16	*	*	NOxHigh_32	NOx	181.40	0.00	0.00	181.40	NOxHigh_32	NOx	0.00	181.40	181.20	-0.20	-0.1	27.21	15.0	CG364233	1/13/2014
10/16/2013	09:16	*	*	NOxHigh_32	NOx	391.20	0.00	0.00	391.20	NOxHigh_32	NOx	0.00	391.20	394.30	3.10	0.8	58.68	15.0	CG331503	5/15/2014
10/16/2013	11:37	*	*	NOxLow_32	NOx	12.99	0.00	0.00	12.99	NOxLow_32	NOx	0.00	12.99	12.78	-0.21	-1.6	1.95	15.0	CG208311	5/15/2014
10/16/2013	11:37	*	*	NOxLow_32	NOx	27.59	0.00	0.00	27.59	NOxLow_32	NOx	0.00	27.59	27.57	-0.02	-0.1	4.14	15.0	CG364299	1/19/2014
10/16/2013	10:46	*	*	NOxLow_32	NOx	12.99	0.00	0.00	12.99	NOxLow_32	NOx	0.00	12.99	12.76	-0.23	-1.8	1.95	15.0	CG208311	5/15/2014
10/16/2013	10:46	*	*	NOxLow_32	NOx	27.59	0.00	0.00	27.59	NOxLow_32	NOx	0.00	27.59	27.55	-0.04	-0.1	4.14	15.0	CG364299	1/19/2014
10/16/2013	09:16	*	*	NOxLow_32	NOx	12.99	0.00	0.00	12.99	NOxLow_32	NOx	0.00	12.99	12.79	-0.20	-1.5	1.95	15.0	CG208311	5/15/2014
10/16/2013	09:16	*	*	NOxLow_32	NOx	27.59	0.00	0.00	27.59	NOxLow_32	NOx	0.00	27.59	27.65	0.06	0.2	4.14	15.0	CG364299	1/19/2014
10/16/2013	11:37	*	*	O2_32	O2	6.21	0.00	0.00	6.21	O2_32	O2	0.00	6.21	6.40	0.19	3.1	0.93	15.0	CG432333	8/26/2021
10/16/2013	11:37	*	*	O2_32	O2	13.48	0.00	0.00	13.48	O2_32	O2	0.00	13.48	13.91	0.03	0.2	2.08	15.0	CG107578	3/1/2021

# Babcock & Wilcox Power Generation Group NetDAHSE

Version 84.0

CGA Calibration Report  
Generated: 10/16/2013

Company: BP Products North America, Inc.  
Plant: 2835 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/1/2013  
Period End: 10/15/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	3 Pt.	Channel	Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	Pass	Bottle ID	Expiry Date
10/16/2013	10:46	*	*	O2_32	O2	6.21	6.41	0.20	3.2	0.93	15.0	CC432333	8/26/2021
10/16/2013	10:46	*	*	O2_32	O2	13.88	13.92	0.04	0.3	2.08	15.0	CC107578	3/1/2021
10/16/2013	09:16	*	*	O2_32	O2	6.21	6.40	0.19	3.1	0.93	15.0	CC432333	8/26/2021
10/16/2013	09:16	*	*	O2_32	O2	13.88	13.91	0.03	0.2	2.08	15.0	CC107578	3/1/2021

**FAIL** - Difference Error > Regulations Allow  
**TARG** = Invalid Target (not within regulatory specs)  
**RDG** = Reading exceeds "Range of Analyzer"  
**@** Bottle is within 7 days of expiration  
**#** Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff Units	Target %	Diff Units	Target %
COHigh_32	54.00	4.4%	105.00	3.7%
COLow_32	1.50	5.5%	1.53	2.7%
NOxHigh_32	0.40	0.2%	2.90	0.7%
NOxLow_32	0.21	1.6%	0.00	0.0%
O2_32	0.19	3.1%	0.03	0.2%

## Performance Specification

Channel	Units	Target	Diff	Target	Diff	Target	Diff	Target
COHigh_32	CO	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%
COLow_32	CO	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%
NOxHigh_32	NOx	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%
NOxLow_32	NOx	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%
O2_32	O2	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%	<=15.0%

**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
**AltPerf:** [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Tech Signature: C. Smith Date: 10/17/13

Title: Supervisor Signature: Bico Heya Date: 10/16/13

Linearity Calibration Report  
Generated: 10/16/2013

Period Start: 10/1/2013  
Period End: 10/16/2013  
Included Calibrations: Linearity (40CFR75)

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Range of Analyzers:

Span of Analyzers:

O2_32	25.00 %O2	O2_32	O2	0.00	25.00 %O2
NOxLow_32	50.00 ppm	NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	700.0 ppm	NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%	Bottle ID	Expire Date
10/16/2013	11:37	NOxHigh_32	NOx	181.400	181.000	-0.400	-0.2	9.070	5.0	CC364233	1/13/2014
10/16/2013	11:37	NOxHigh_32	NOx	391.200	394.200	3.000	0.8	19.560	5.0	CC331503	5/15/2014
10/16/2013	11:37	NOxHigh_32	NOx	637.700	637.000	-0.700	-0.1	31.885	5.0	SG9168086BAL	8/23/2021
10/16/2013	10:46	NOxHigh_32	NOx	181.400	180.800	-0.600	-0.3	9.070	5.0	CC364233	1/13/2014
10/16/2013	10:46	NOxHigh_32	NOx	391.200	393.800	2.600	0.7	19.560	5.0	CC331503	5/15/2014
10/16/2013	10:46	NOxHigh_32	NOx	637.700	637.000	-0.700	-0.1	31.885	5.0	SG9168086BAL	8/23/2021
10/16/2013	09:16	NOxHigh_32	NOx	181.400	191.200	-0.200	-0.1	9.070	5.0	CC364233	1/13/2014
10/16/2013	09:16	NOxHigh_32	NOx	391.200	394.300	3.100	0.8	19.560	5.0	CC331503	5/15/2014
10/16/2013	09:16	NOxHigh_32	NOx	637.700	638.300	0.600	0.1	31.885	5.0	SG9168086BAL	8/23/2021
10/16/2013	11:37	NOxLow_32	NOx	12.990	12.780	-0.210	-1.5	0.650	5.0	CC208311	5/15/2014
10/16/2013	11:37	NOxLow_32	NOx	27.590	27.570	-0.020	0.0	1.380	5.0	CC364299	1/19/2014
10/16/2013	11:37	NOxLow_32	NOx	46.070	45.910	-0.160	-0.4	2.303	5.0	CC322884	8/5/2016
10/16/2013	10:46	NOxLow_32	NOx	12.990	12.760	-0.230	-1.5	0.650	5.0	CC208311	5/15/2014
10/16/2013	10:46	NOxLow_32	NOx	27.590	27.550	-0.040	0.0	1.380	5.0	CC364299	1/19/2014
10/16/2013	10:46	NOxLow_32	NOx	46.070	45.910	-0.160	-0.4	2.303	5.0	CC322884	8/5/2016
10/16/2013	09:16	NOxLow_32	NOx	12.990	12.790	-0.200	-1.5	0.650	5.0	CC208311	5/15/2014
10/16/2013	09:16	NOxLow_32	NOx	27.590	27.650	0.060	0.4	1.380	5.0	CC364299	1/19/2014
10/16/2013	09:16	NOxLow_32	NOx	46.070	46.020	-0.050	0.0	2.303	5.0	CC322884	8/5/2016
10/16/2013	11:37	O2_32	O2	6.210	6.400	0.190	3.2	0.310	5.0	CC432333	8/26/2021
10/16/2013	11:37	O2_32	O2	13.880	13.910	0.030	0.0	0.694	5.0	CC107578	3/1/2021
10/16/2013	11:37	O2_32	O2	21.030	21.070	0.040	0.0	1.052	5.0	CC409778	7/25/2021
10/16/2013	10:46	O2_32	O2	6.210	6.410	0.200	3.2	0.310	5.0	CC432333	8/26/2021
10/16/2013	10:46	O2_32	O2	13.880	13.920	0.040	0.0	0.694	5.0	CC107578	3/1/2021
10/16/2013	10:46	O2_32	O2	21.030	21.070	0.040	0.0	1.052	5.0	CC409778	7/25/2021
10/16/2013	09:16	O2_32	O2	6.210	6.400	0.190	3.2	0.310	5.0	CC432333	8/26/2021
10/16/2013	09:16	O2_32	O2	13.880	13.910	0.030	0.0	0.694	5.0	CC107578	3/1/2021
10/16/2013	09:16	O2_32	O2	21.030	21.070	0.040	0.0	1.052	5.0	CC409778	7/25/2021

FAIL = Difference Error > Regulations Allow

TARG = Invalid Target (not within regulatory specs)

RDG = Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/1/2013  
Period End: 10/16/2013  
Included Calibrations: Linearity (40CFR75)

Linearity Calibration Report  
Generated: 10/16/2013

Absolute Average DIFF and Absolute(Target - Average Reading)/(Target) \* 100

Channel	---LOW---		---MID---		---HIGH---	
	Diff	Target	Diff	Target	Diff	Target
NOxHigh_32	0.400	0.2%	2.900	0.7%	0.267	0.0%
NOxLow_32	0.213	1.6%	0.000	0.0%	0.123	0.3%
O2_32	0.193	3.1%	0.033	0.2%	0.040	0.2%

Performance Specification

Channel	PASS	FAIL
NOxHigh_32	<=5.0%	>5.0%
NOxLow_32	<=5.0%	>5.0%
O2_32	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Tech Signature: L. Smith Date: 10/17/13  
Title: Supv Signature: Bill Hughes Date: 10/16/13

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

CGA Calibration Report  
Generated: 10/6/2013

Company: BP Products North America, Inc.,  
Plant: 2915 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/6/2013  
Period End: 10/6/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

Span of Analyzers:

O2_33	0.00	25.00 %O2	O2	0.00	25.00 %O2
CO_Low_33	0.00	100.00 ppm	CO	0.00	100.00 ppm
CO_High_33	0	5000 ppm	CO	0	5000 ppm
NOxLow_33	0.00	50.00 ppm	NOx	0.00	50.00 ppm
NOxHigh_33	0.0	700.0 ppm	NOx	0.0	700.0 ppm

Date	Time	From	3 Pt.	Channel	Type	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)	Bottle ID	Expiry Date
10/06/2013	08:51			CO_High_33	CO	1236.0	1272.0	36.0	2.9	185.4	15.0	CG174083	11/3/2014
10/06/2013	08:51			CO_Low_33	CO	2810.0	2770.0	-40.0	-1.4	421.5	15.0	CG332257	11/19/2014
10/06/2013	08:11			CO_High_33	CO	1236.0	1273.0	37.0	3.0	185.4	15.0	CC174083	11/19/2013
10/06/2013	08:11			CO_Low_33	CO	2810.0	2772.0	-38.0	-1.4	421.5	15.0	CC332257	11/19/2014
10/06/2013	07:28			CO_High_33	CO	1236.0	1273.0	37.0	3.0	185.4	15.0	CC174083	11/3/2013
10/06/2013	07:28			CO_Low_33	CO	2810.0	2774.0	-36.0	-1.3	421.5	15.0	CC332257	11/19/2014
10/06/2013	08:51			CO_Low_33	CO	24.9	25.9	1.0	4.1	3.7	15.0	CC134940	1/23/2015
10/06/2013	08:51			CO_Low_33	CO	54.4	54.9	0.5	0.9	8.2	15.0	CC349278	5/14/2015
10/06/2013	08:11			CO_Low_33	CO	24.9	26.0	1.1	4.2	3.7	15.0	CC134940	1/23/2015
10/06/2013	08:11			CO_Low_33	CO	54.4	54.9	0.5	0.9	8.2	15.0	CC349278	5/14/2015
10/06/2013	07:28			CO_Low_33	CO	24.9	25.9	1.0	4.1	3.7	15.0	CC134940	1/23/2015
10/06/2013	07:28			CO_Low_33	CO	54.4	55.0	0.5	1.0	8.2	15.0	CC349278	5/14/2015
10/06/2013	08:51			NOxHigh_33	NOx	179.7	184.9	5.2	2.9	27.0	15.0	SG9113406BAL	5/2/2014
10/06/2013	08:51			NOxHigh_33	NOx	395.3	402.0	6.7	1.7	59.3	15.0	SG9148157BAL	1/17/2014
10/06/2013	08:11			NOxHigh_33	NOx	179.7	184.8	5.1	2.8	27.0	15.0	SG9148157BAL	5/2/2014
10/06/2013	08:11			NOxHigh_33	NOx	395.3	402.4	7.1	1.8	59.3	15.0	SG9113406BAL	5/2/2014
10/06/2013	07:28			NOxHigh_33	NOx	179.7	184.9	5.2	2.9	27.0	15.0	SG9113406BAL	5/2/2014
10/06/2013	07:28			NOxHigh_33	NOx	395.3	401.9	-6.6	-1.7	59.3	15.0	CC174083	11/3/2013
10/06/2013	08:51			NOxLow_33	NOx	12.5	12.3	-0.2	-1.8	1.9	15.0	CC332257	11/19/2014
10/06/2013	08:51			NOxLow_33	NOx	27.5	26.9	-0.6	-2.2	4.1	15.0	CC174083	11/3/2013
10/06/2013	08:11			NOxLow_33	NOx	12.5	12.3	-0.2	-1.9	1.9	15.0	CC332257	11/19/2014
10/06/2013	08:11			NOxLow_33	NOx	27.5	27.0	-0.5	-1.9	4.1	15.0	CC174083	11/3/2013
10/06/2013	07:28			NOxLow_33	NOx	12.5	12.2	-0.3	-2.2	1.9	15.0	CC332257	11/19/2014
10/06/2013	07:28			NOxLow_33	NOx	27.5	26.9	-0.6	-2.2	4.1	15.0	CC134940	1/23/2015
10/06/2013	08:51			O2_33	O2	6.3	6.2	-0.1	-1.4	0.9	15.0	CC134940	1/23/2015
10/06/2013	08:51			O2_33	O2	13.7	13.6	-0.1	-0.7	2.1	15.0	CC349278	5/14/2015

CGA Calibration Report  
Generated: 10/6/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: Stack

Period Start: 10/6/2013  
Period End: 10/6/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	CGA Allowable	Bottle ID	Expiry Date
10/06/2013	06:11	*	02_33	02	6.3	6.2	-0.1	0.9	CG134940	1/23/2015
10/06/2013	06:11	*	02_33	02	13.7	13.6	-0.1	2.1	CG1349278	5/14/2015
10/06/2013	07:28	*	02_33	02	6.3	6.2	-0.1	0.9	CG134940	1/23/2015
10/06/2013	07:28	*	02_33	02	13.7	13.6	-0.1	2.1	CG1349278	5/14/2015

FAIL = Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff	Target	Diff	Target
COHigh_33	36.7	3.01	38.0	1.41
COLow_33	1.0	4.13	0.5	0.90
NOXHigh_33	5.2	2.90	6.8	1.78
NOXLow_33	0.2	1.74	0.5	2.18
O2_33	0.1	1.48	0.1	0.78

Performance Specification

Channel	PASS	FAIL
COHigh_33	<=15.0%	>15.0%
COLow_33	<=15.0%	>15.0%
NOXHigh_33	<=15.0%	>15.0%
NOXLow_33	<=15.0%	>15.0%
O2_33	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Analyzer Technician Signature: Joseph W. White Date: 10/6/13  
Title: Analyzer Supervisor Signature: [Signature] Date: 10/7/13

Babcock & Wilcox Power Generation Group NetDAHS®

Linearity Calibration Report

Generated: 10/6/2013

Period Start: 10/6/2013  
Period End: 10/6/2013  
Included Calibrations: Linearity (40CFR75)

Company: BP Products North America, Inc.  
Plant: 2015 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Range of Analyzers:

Span of Analyzers:

O2_33	O2	0.00	25.00 %O2	O2_33	O2	0.00	25.00 %O2
COHigh_33	CO	0.00	100.00 ppm	COHigh_33	CO	0.00	100.00 ppm
COLow_33	CO	0	5000 ppm	COLow_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm	NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm	NOxHigh_33	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Bottle ID	Expire Date
10/06/2013	08:51	COHigh_33	LOW	1236.000	1272.000	36.000	- N/A -	- N/A -	CG174083	11/3/2013
10/06/2013	08:51	COHigh_33	CO	2810.000	2770.000	-40.000	- N/A -	- N/A -	CG332257	1/19/2014
10/06/2013	08:51	COHigh_33	HIGH	4505.000	4489.000	-16.000	- N/A -	- N/A -	CC260699	8/23/2016
10/06/2013	08:11	COHigh_33	LOW	1236.000	1273.000	37.000	- N/A -	- N/A -	CC174083	11/3/2013
10/06/2013	08:11	COHigh_33	MID	2810.000	2772.000	-38.000	- N/A -	- N/A -	CC332257	1/19/2014
10/06/2013	08:11	COHigh_33	CO	4505.000	4490.000	-15.000	- N/A -	- N/A -	CC260699	8/23/2016
10/06/2013	08:11	COHigh_33	HIGH	1236.000	1273.000	37.000	- N/A -	- N/A -	CC174083	11/3/2013
10/06/2013	07:28	COHigh_33	LOW	2810.000	2774.000	-36.000	- N/A -	- N/A -	CC332257	1/19/2014
10/06/2013	07:28	COHigh_33	CO	4505.000	4493.000	-12.000	- N/A -	- N/A -	CC260699	8/23/2016
10/06/2013	07:28	COHigh_33	HIGH	24.900	25.920	1.020	- N/A -	- N/A -	CC134940	1/23/2015
10/06/2013	08:51	COLow_33	LOW	54.430	54.920	0.490	- N/A -	- N/A -	CC349278	5/14/2015
10/06/2013	08:51	COLow_33	MID	91.410	90.270	-1.140	- N/A -	- N/A -	CC262188	5/20/2021
10/06/2013	08:51	COLow_33	HIGH	24.900	25.950	1.050	- N/A -	- N/A -	CC134940	1/23/2015
10/06/2013	08:11	COLow_33	LOW	54.430	54.920	0.490	- N/A -	- N/A -	CC349278	5/14/2015
10/06/2013	08:11	COLow_33	MID	91.410	90.340	-1.070	- N/A -	- N/A -	CC262188	5/20/2021
10/06/2013	08:11	COLow_33	HIGH	24.900	25.920	1.020	- N/A -	- N/A -	CC134940	1/23/2015
10/06/2013	07:28	COLow_33	LOW	54.430	54.980	0.550	- N/A -	- N/A -	CC349278	5/14/2015
10/06/2013	07:28	COLow_33	MID	91.410	90.330	-1.080	- N/A -	- N/A -	CC262188	5/20/2021
10/06/2013	07:28	COLow_33	HIGH	179.700	184.900	5.200	- N/A -	- N/A -	SG9148157BAL	5/2/2014
10/06/2013	08:51	NOxHigh_33	LOW	395.300	402.000	6.700	1.7	19.765	SG9113406BAL	1/11/2014
10/06/2013	08:51	NOxHigh_33	MID	638.400	641.600	3.200	0.5	31.920	CC232893	8/26/2021
10/06/2013	08:51	NOxHigh_33	HIGH	179.700	184.800	5.100	2.8	8.985	SG9148157BAL	5/2/2014
10/06/2013	08:11	NOxHigh_33	LOW	395.300	402.400	7.100	1.8	19.765	SG9113406BAL	1/17/2014
10/06/2013	08:11	NOxHigh_33	MID	638.400	641.700	3.300	0.5	31.920	CC232893	8/26/2021
10/06/2013	08:11	NOxHigh_33	HIGH	179.700	184.900	5.200	2.9	8.985	SG9148157BAL	5/2/2014
10/06/2013	07:28	NOxHigh_33	LOW	395.300	401.900	6.600	1.7	19.765	SG9113406BAL	1/17/2014
10/06/2013	07:28	NOxHigh_33	MID	638.400	641.500	3.100	0.5	31.920	CC232893	8/26/2021

Linearity Calibration Report  
Generated: 10/6/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/6/2013  
Period End: 10/6/2013  
Included Calibrations: Linearity (40CFR75)

Date	Time	Channel	Type	Target Units	Actual Units	Dif Units	Error %	Linearity Allowable Units	%	Pass	Bottle ID	Expire Date
10/06/2013	08:51	NOxLow_33	LOW	12.500	12.280	-0.220	-1.6	0.625	5.0	PASS	CC174083	11/3/2013
10/06/2013	08:51	NOxLow_33	MID	27.510	26.910	-0.600	-2.2	1.375	5.0	PASS	CC332257	1/19/2014
10/06/2013	08:51	NOxLow_33	HIGH	45.430	44.610	-0.820	-1.8	2.272	5.0	PASS	CC260699	8/23/2016
10/06/2013	08:11	NOxLow_33	LOW	12.500	12.340	-0.160	-1.6	0.625	5.0	PASS	CC174083	11/3/2013
10/06/2013	08:11	NOxLow_33	MID	27.510	26.980	-0.530	-1.8	1.375	5.0	PASS	CC332257	1/19/2014
10/06/2013	08:11	NOxLow_33	HIGH	45.430	44.690	-0.740	-1.5	2.272	5.0	PASS	CC260699	8/23/2016
10/06/2013	07:28	NOxLow_33	LOW	12.500	12.230	-0.270	-2.2	0.625	5.0	PASS	CC174083	11/3/2013
10/06/2013	07:28	NOxLow_33	MID	27.510	26.900	-0.610	-2.2	1.375	5.0	PASS	CC332257	1/19/2014
10/06/2013	07:28	NOxLow_33	HIGH	45.430	44.580	-0.850	-1.8	2.272	5.0	PASS	CC260699	8/23/2016
10/06/2013	08:51	O2_33	LOW	6.260	6.170	-0.090	-1.6	0.313	5.0	PASS	CC134940	1/23/2015
10/06/2013	08:51	O2_33	MID	13.720	13.620	-0.100	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/06/2013	08:51	O2_33	HIGH	20.990	20.860	-0.130	-0.5	1.049	5.0	PASS	CC262188	5/20/2021
10/06/2013	08:11	O2_33	LOW	6.260	6.170	-0.090	-1.6	0.313	5.0	PASS	CC134940	1/23/2015
10/06/2013	08:11	O2_33	MID	13.720	13.630	-0.090	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/06/2013	08:11	O2_33	HIGH	20.990	20.870	-0.120	-0.5	1.049	5.0	PASS	CC262188	5/20/2021
10/06/2013	07:28	O2_33	LOW	6.260	6.170	-0.090	-1.6	0.313	5.0	PASS	CC134940	1/23/2015
10/06/2013	07:28	O2_33	MID	13.720	13.630	-0.090	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/06/2013	07:28	O2_33	HIGH	20.990	20.870	-0.120	-0.5	1.049	5.0	PASS	CC262188	5/20/2021

FAIL - Difference Error > Regulations Allow

TARG - Invalid Target (not within regulatory specs)

RDC - Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Linearity Calibration Report  
Generated: 10/6/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/SL: Whiting, IN 46394  
Source: stack

Period Start: 10/6/2013  
Period End: 10/6/2013  
Included Calibrations: Linearity (40CFR75)

Absolute Average Diff and Absolute(Target - Average Reading/Target) \* 100

Channel	----LOW----		----MID----		----HIGH----	
	Diff	Target	Diff	Target	Diff	Target
	Units	%	Units	%	Units	%
COHigh_33	36.667	- N/A -	38.000	- N/A -	14.333	- N/A -
COLow_33	1.030	- N/A -	0.510	- N/A -	1.097	- N/A -
NOxHigh_33	5.167	2.9%	6.800	1.7%	3.200	0.5%
NOxLow_33	0.217	1.7%	0.580	2.1%	0.803	1.8%
O2_33	0.090	1.4%	0.093	0.7%	0.123	0.6%

Performance Specification

Channel	PASS		FAIL	
	- N/A -	- N/A -	- N/A -	- N/A -
COHigh_33	CO	- N/A -	CO	- N/A -
COLow_33	CO	- N/A -	CO	- N/A -
NOxHigh_33	NOx	<=5.0%	NOx	>5.0%
NOxLow_33	NOx	<=5.0%	NOx	>5.0%
O2_33	O2	<=5.0%	O2	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Analyzer Technician Signature: Joseph Wilcox Date: 10/6/13  
Title: Analyzer Supervisor Signature: [Signature] Date: 10/7/13

CGA Calibration Report  
Generated: 10/5/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/5/2013  
Period End: 10/5/2013  
Included Calibrations: CGA (40CFR60)

Range of Analyzers:

Span of Analyzers:

From	To	Target	Actual	Diff	Error %	Units	CGA Allowable (40CFR60)
O2_34	O2	25.00 %O2	25.00 %O2	0.00	0.00	25.00 %O2	
CO_Low_34	CO	100.00 ppm	100.00 ppm	0.00	0.00	100.00 ppm	
CO_High_34	CO	5000 ppm	5000 ppm	0	0	5000 ppm	
NOx_Low_34	NOx	50.00 ppm	50.00 ppm	0.00	0.00	50.00 ppm	
NOx_High_34	NOx	700.0 ppm	700.0 ppm	0.0	0.0	700.0 ppm	

Date	Time	From	3 PL.	Channel	Type	Target	Actual	Diff	Error %	Units	Bottle ID	Expiry Date
10/05/2013	09:34	*	*	CO_High_34	CO	1236.0	1215.0	-21.0	-1.7	185.4	CC174083	11/3/2013
10/05/2013	09:34	*	*	CO_High_34	CO	2810.0	2747.0	-63.0	-2.2	421.5	CC332257	11/3/2013
10/05/2013	08:54	*	*	CO_High_34	CO	1236.0	1215.0	-21.0	-1.7	185.4	CC174083	11/3/2013
10/05/2013	08:54	*	*	CO_High_34	CO	2810.0	2748.0	-62.0	-2.2	421.5	CC332257	11/3/2013
10/05/2013	08:13	*	*	CO_High_34	CO	1236.0	1215.0	-21.0	-1.7	185.4	CC174083	11/3/2013
10/05/2013	08:13	*	*	CO_High_34	CO	2810.0	2749.0	-61.0	-2.2	421.5	CC332257	11/3/2013
10/05/2013	09:34	*	*	CO_Low_34	CO	24.9	25.0	0.1	0.3	3.7	CC134940	1/23/2015
10/05/2013	09:34	*	*	CO_Low_34	CO	54.4	54.3	-0.2	-0.3	8.2	CC349278	5/14/2015
10/05/2013	08:54	*	*	CO_Low_34	CO	24.9	25.0	0.1	0.3	3.7	CC134940	1/23/2015
10/05/2013	08:54	*	*	CO_Low_34	CO	54.4	54.3	-0.2	-0.3	8.2	CC349278	5/14/2015
10/05/2013	08:13	*	*	CO_Low_34	CO	24.9	24.9	0.0	-0.1	3.7	CC134940	1/23/2015
10/05/2013	08:13	*	*	CO_Low_34	CO	54.4	54.3	-0.2	-0.3	8.2	CC349278	5/14/2015
10/05/2013	09:34	*	*	NOx_High_34	NOx	179.7	187.3	7.6	4.2	27.0	SG9148157BAL	5/2/2014
10/05/2013	09:34	*	*	NOx_High_34	NOx	395.3	405.0	9.7	2.5	59.3	SG9113406BAL	1/17/2014
10/05/2013	08:54	*	*	NOx_High_34	NOx	179.7	187.1	7.4	4.1	27.0	SG9148157BAL	5/2/2014
10/05/2013	08:54	*	*	NOx_High_34	NOx	395.3	405.2	9.9	2.5	59.3	SG9113406BAL	1/17/2014
10/05/2013	08:13	*	*	NOx_High_34	NOx	179.7	187.3	7.6	4.2	27.0	SG9148157BAL	5/2/2014
10/05/2013	08:13	*	*	NOx_High_34	NOx	395.3	405.1	9.8	2.5	59.3	SG9113406BAL	1/17/2014
10/05/2013	09:34	*	*	NOx_Low_34	NOx	12.5	12.5	0.0	0.2	1.9	CC174083	11/3/2013
10/05/2013	09:34	*	*	NOx_Low_34	NOx	27.5	27.1	-0.4	-1.3	4.1	CC332257	11/3/2013
10/05/2013	08:54	*	*	NOx_Low_34	NOx	12.5	12.5	0.0	0.2	1.9	CC174083	11/3/2013
10/05/2013	08:54	*	*	NOx_Low_34	NOx	27.5	27.2	-0.3	-1.1	4.1	CC332257	11/3/2013
10/05/2013	08:13	*	*	NOx_Low_34	NOx	12.5	12.5	0.0	0.1	1.9	CC174083	11/3/2013
10/05/2013	08:13	*	*	NOx_Low_34	NOx	27.5	27.2	-0.3	-1.1	4.1	CC332257	11/3/2013
10/05/2013	09:34	*	*	O2_34	O2	6.3	6.2	-0.1	-0.8	0.9	CC134940	1/23/2015
10/05/2013	09:34	*	*	O2_34	O2	13.7	13.7	0.0	-0.2	2.1	CC349278	5/14/2015

CGA Calibration Report  
Generated: 10/5/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/5/2013  
Period End: 10/5/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expiry Date
10/05/2013	08:54	3 Ft.	02_34	LOW	6.3	6.2	-0.1	-0.8	0.9	CC134940	1/23/2015
10/05/2013	08:54		02_34	O2	13.7	13.7	0.0	-0.1	2.1	CC349278	5/14/2015
10/05/2013	08:13		02_34	IOW	6.3	6.2	0.0	-0.6	0.9	CC134940	1/23/2015
10/05/2013	08:13		02_34	MID	13.7	13.7	0.0	-0.1	2.1	CC349278	5/14/2015

FAIL = Difference Prior > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute (Target - Average Reading)/Target \* 100

Channel	Diff	Target	Diff	Target
COHigh_34	21.0	1.74	62.0	2.21
COLow_34	0.0	0.23	0.2	0.38
NOXHigh_34	7.5	4.28	9.8	2.58
NOXLow_34	0.0	0.18	0.3	1.28
O2_34	0.0	0.78	0.0	0.28

Performance Specification

Channel	Diff	Target	Diff	Target
COHigh_34	21.0	1.74	62.0	2.21
COLow_34	0.0	0.23	0.2	0.38
NOXHigh_34	7.5	4.28	9.8	2.58
NOXLow_34	0.0	0.18	0.3	1.28
O2_34	0.0	0.78	0.0	0.28

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOX] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOX] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOX] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOX] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: Analyst Signature: Joseph Wilcox Date: 10/5/13

Title: Analyst Signature: [Signature] Date: 10/5/13

Company: BP Products North America, Inc.  
Plant: 2915 Indianapolis Blvd.  
City/St: Whitening, IN 46394  
Source: stack

Linearity Calibration Report  
Generated: 10/5/2013

Period Start: 10/5/2013  
Period End: 10/5/2013  
Included Calibrations: Linearity (40CFR75)

Range of Analyzers:

Span of Analyzers:

Date	Time	Channel	Type	Target		Actual		Diff	Error %		Linearity Allowable (40CFR75)		Bottle ID	Expire Date
				Units	%	Units	%	Units	Units	%	Units	%		
10/05/2013	08:34	COHigh_34	CO	1236.000		1215.000		-21.000	- N/A	-	- N/A	-	CG174083	11/3/2013
10/05/2013	09:34	COHigh_34	CO	2810.000		2747.000		-63.000	- N/A	-	- N/A	-	CG332257	1/19/2014
10/05/2013	09:34	COHigh_34	CO	4505.000		4516.000		11.000	- N/A	-	- N/A	-	CC260699	8/23/2016
10/05/2013	08:54	COHigh_34	CO	1236.000		1215.000		-21.000	- N/A	-	- N/A	-	CG174083	11/3/2013
10/05/2013	08:54	COHigh_34	CO	2810.000		2748.000		-62.000	- N/A	-	- N/A	-	CG332257	1/19/2014
10/05/2013	08:54	COHigh_34	CO	4505.000		4519.000		14.000	- N/A	-	- N/A	-	CC260699	8/23/2016
10/05/2013	08:13	COHigh_34	CO	1236.000		1215.000		-21.000	- N/A	-	- N/A	-	CG174083	11/3/2013
10/05/2013	08:13	COHigh_34	CO	2810.000		2749.000		-61.000	- N/A	-	- N/A	-	CG332257	1/19/2014
10/05/2013	08:13	COHigh_34	CO	4505.000		4519.000		14.000	- N/A	-	- N/A	-	CC260699	8/23/2016
10/05/2013	09:34	COHigh_34	CO	24.900		24.970		0.070	- N/A	-	- N/A	-	CG134940	1/23/2015
10/05/2013	09:34	COHigh_34	CO	54.430		54.280		-0.150	- N/A	-	- N/A	-	CC349278	5/14/2015
10/05/2013	08:54	COHigh_34	CO	91.410		90.840		-0.570	- N/A	-	- N/A	-	CC262188	5/20/2021
10/05/2013	08:54	COHigh_34	CO	24.900		24.970		0.070	- N/A	-	- N/A	-	CG134940	1/23/2015
10/05/2013	08:54	COHigh_34	CO	54.430		54.270		-0.160	- N/A	-	- N/A	-	CC349278	5/14/2015
10/05/2013	08:54	COHigh_34	CO	91.410		90.860		-0.550	- N/A	-	- N/A	-	CC262188	5/20/2021
10/05/2013	08:13	COHigh_34	CO	24.900		24.880		-0.020	- N/A	-	- N/A	-	CG134940	1/23/2015
10/05/2013	08:13	COHigh_34	CO	54.430		54.250		-0.180	- N/A	-	- N/A	-	CC349278	5/14/2015
10/05/2013	08:13	COHigh_34	CO	91.410		90.830		-0.580	- N/A	-	- N/A	-	CC262188	5/20/2021
10/05/2013	09:34	NOXHigh_34	NOX	179.700		187.300		7.600	4.2	8.985	5.0	PASS	SG9148157BAL	5/2/2014
10/05/2013	09:34	NOXHigh_34	NOX	395.300		405.000		9.700	2.5	19.765	5.0	PASS	SG9113406BAL	1/1/2014
10/05/2013	09:34	NOXHigh_34	NOX	638.400		639.600		1.200	0.2	31.920	5.0	PASS	CC232893	8/26/2021
10/05/2013	08:54	NOXHigh_34	NOX	179.700		187.100		7.400	4.1	8.985	5.0	PASS	SG9148157BAL	5/2/2014
10/05/2013	08:54	NOXHigh_34	NOX	395.300		405.200		9.900	2.5	19.765	5.0	PASS	SG9113406BAL	1/1/2014
10/05/2013	08:54	NOXHigh_34	NOX	638.400		639.600		1.200	0.2	31.920	5.0	PASS	CC232893	8/26/2021
10/05/2013	08:13	NOXHigh_34	NOX	179.700		187.300		7.600	4.2	8.985	5.0	PASS	SG9148157BAL	5/2/2014
10/05/2013	08:13	NOXHigh_34	NOX	395.300		405.100		9.800	2.5	19.765	5.0	PASS	SG9113406BAL	1/1/2014
10/05/2013	08:13	NOXHigh_34	NOX	638.400		639.900		1.500	0.2	31.920	5.0	PASS	CC232893	8/26/2021

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: slack

Linearity Calibration Report  
Generated: 10/5/2013

Period Start: 10/5/2013  
Period End: 10/5/2013  
Included Calibrations: Linearity (40CFR75)

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable Units	Linearity Allowable %	Pass	Bottle ID	Expire Date
10/05/2013	09:34	NOxLow 34	NOx	12.500	12.520	0.020	0.0	0.625	5.0	PASS	CC174083	11/3/2013
10/05/2013	09:34	NOxLow 34	NOx	27.510	27.150	-0.360	-1.5	1.375	5.0	PASS	CC332257	1/19/2014
10/05/2013	09:34	NOxLow 34	NOx	45.430	45.010	-0.420	-0.9	2.272	5.0	PASS	CC260699	8/23/2016
10/05/2013	08:54	NOxLow 34	NOx	12.500	12.520	0.020	0.0	0.625	5.0	PASS	CC174083	11/3/2013
10/05/2013	08:54	NOxLow 34	NOx	27.510	27.210	-0.300	-1.1	1.375	5.0	PASS	CC332257	1/19/2014
10/05/2013	08:54	NOxLow 34	NOx	45.430	45.000	-0.430	-0.9	2.272	5.0	PASS	CC260699	8/23/2016
10/05/2013	08:13	NOxLow 34	NOx	12.500	12.510	0.010	0.0	0.625	5.0	PASS	CC174083	11/3/2013
10/05/2013	08:13	NOxLow 34	NOx	27.510	27.200	-0.310	-1.1	1.375	5.0	PASS	CC332257	1/19/2014
10/05/2013	08:13	NOxLow 34	NOx	45.430	44.980	-0.450	-1.1	2.272	5.0	PASS	CC260699	8/23/2016
10/05/2013	09:34	O2 34	O2	6.260	6.210	-0.050	-1.6	0.313	5.0	PASS	CC134940	1/23/2015
10/05/2013	09:34	O2 34	O2	13.720	13.690	-0.030	0.0	0.686	5.0	PASS	CC349278	5/14/2015
10/05/2013	09:34	O2 34	O2	20.990	20.970	-0.020	0.0	1.049	5.0	PASS	CC262188	5/20/2021
10/05/2013	08:54	O2 34	O2	6.260	6.210	-0.050	-1.6	0.313	5.0	PASS	CC134940	1/23/2015
10/05/2013	08:54	O2 34	O2	13.720	13.700	-0.020	0.0	0.686	5.0	PASS	CC349278	5/14/2015
10/05/2013	08:54	O2 34	O2	20.990	20.980	-0.010	0.0	1.049	5.0	PASS	CC262188	5/20/2021
10/05/2013	08:13	O2 34	O2	6.260	6.220	-0.040	0.0	0.313	5.0	PASS	CC134940	1/23/2015
10/05/2013	08:13	O2 34	O2	13.720	13.700	-0.020	0.0	0.686	5.0	PASS	CC349278	5/14/2015
10/05/2013	08:13	O2 34	O2	20.990	20.980	-0.010	0.0	1.049	5.0	PASS	CC262188	5/20/2021

FAIL = Difference Error > Regulations Allow

TARG = Invalid Target (not within regulatory specs)

RDC = Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/State: Whiting, IN 46394  
Source: Stack

Period Start: 10/5/2013  
Period End: 10/5/2013  
Included Calibrations: Linearity (40CFR75)

Linearity Calibration Report  
Generated: 10/5/2013

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100			
		---LOW---	---HIGH---
Channel	Target	Diff	Target
	%	Units	%
COHigh_34	- N/A -	62.000	- N/A -
COLow_34	- N/A -	0.163	- N/A -
NOxHigh_34	4.2%	9.800	2.5%
NOxLow_34	0.1%	0.323	1.2%
O2_34	0.7%	0.023	0.2%

Performance Specification

Channel	PHSS	FAIL
COHigh_34	- N/A -	- N/A -
COLow_34	- N/A -	- N/A -
NOxHigh_34	<=5.0%	>5.0%
NOxLow_34	<=5.0%	>5.0%
O2_34	<=5.0%	>5.0%

**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title: Signature: Joseph W. Stille Date: 10/5/13

Title: Signature: [Signature] Date: 10/5/13

# Babcock & Wilcox Power Generation Group NetDAHSE

Version 84.0

CGA Calibration Report  
Generated: 10/4/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/4/2013  
Period End: 10/4/2013  
Included Calibrations: CGA (40CFR60)

## Range of Analyzers:

O2_36	0.00	25.00 %O2
CO_Low_36	0.00	100.00 ppm
CO_High_36	0	5000 ppm
NOx_Low_36	0.00	50.00 ppm
NOx_High_36	0.0	700.0 ppm

## Span of Analyzers:

O2	0.00	25.00 %O2
CO_Low_36	0.00	100.00 ppm
CO_High_36	0	5000 ppm
NOx_Low_36	0.00	50.00 ppm
NOx_High_36	0.0	700.0 ppm

Date	Time	3 Pt.	From	Channel	Type	Target	Actual	Diff	Error	Units	CGA Allowable (40CFR60)	Bottle ID	Expire Date
10/04/2013	09:04			CO_High_36	CO	1236.0	1276.0	40.0	3.2	182.4	15.0	CC174083	11/3/2013
10/04/2013	09:04			CO_Low_36	CO	2810.0	2854.0	44.0	1.6	421.5	15.0	CC332257	11/3/2013
10/04/2013	08:24			CO_High_36	CO	1236.0	1276.0	40.0	3.2	182.4	15.0	CC174083	11/3/2013
10/04/2013	08:24			CO_Low_36	CO	2810.0	2854.0	44.0	1.6	421.5	15.0	CC332257	11/3/2013
10/04/2013	07:42			CO_High_36	CO	1236.0	1275.0	39.0	3.2	185.4	15.0	CC174083	11/3/2013
10/04/2013	07:42			CO_Low_36	CO	2810.0	2850.0	40.0	1.4	421.5	15.0	CC332257	11/3/2013
10/04/2013	09:04			CO_High_36	CO	24.9	24.7	-0.2	-0.7	3.7	15.0	CC134940	1/23/2015
10/04/2013	09:04			CO_Low_36	CO	54.4	54.7	0.3	0.5	8.2	15.0	CC349278	5/14/2015
10/04/2013	08:24			CO_High_36	CO	24.9	24.6	-0.3	-1.1	3.7	15.0	CC134940	1/23/2015
10/04/2013	08:24			CO_Low_36	CO	54.4	54.7	0.2	0.4	8.2	15.0	CC349278	5/14/2015
10/04/2013	07:42			CO_High_36	CO	24.9	24.6	-0.3	-1.3	3.7	15.0	CC134940	1/23/2015
10/04/2013	07:42			CO_Low_36	CO	54.4	54.6	0.2	0.3	8.2	15.0	CC349278	5/14/2015
10/04/2013	09:04			NOx_High_36	NOx	179.7	184.6	4.9	2.7	27.0	15.0	SG9148157	5/2/2014
10/04/2013	09:04			NOx_Low_36	NOx	395.3	400.2	4.9	1.2	59.3	15.0	SG9148157	5/2/2014
10/04/2013	08:24			NOx_High_36	NOx	179.7	185.0	5.3	2.9	27.0	15.0	SG9113406BAL	1/17/2014
10/04/2013	08:24			NOx_Low_36	NOx	395.3	400.3	5.0	1.3	59.3	15.0	SG9113406BAL	1/17/2014
10/04/2013	07:42			NOx_High_36	NOx	179.7	185.0	5.3	2.9	27.0	15.0	SG9148157	5/2/2014
10/04/2013	07:42			NOx_Low_36	NOx	395.3	400.0	4.7	1.2	59.3	15.0	SG9113406BAL	1/17/2014
10/04/2013	09:04			NOx_High_36	NOx	12.5	12.3	-0.2	-1.9	1.9	15.0	CC174083	11/3/2013
10/04/2013	09:04			NOx_Low_36	NOx	27.5	27.1	-0.4	-1.6	4.1	15.0	CC332257	11/3/2013
10/04/2013	08:24			NOx_High_36	NOx	12.5	12.4	-0.1	-1.2	1.9	15.0	CC174083	11/3/2013
10/04/2013	08:24			NOx_Low_36	NOx	27.5	27.1	-0.4	-1.4	4.1	15.0	CC332257	11/3/2013
10/04/2013	07:42			NOx_High_36	NOx	12.5	12.3	-0.2	-1.4	1.9	15.0	CC174083	11/3/2013
10/04/2013	07:42			NOx_Low_36	NOx	27.5	27.1	-0.4	-1.5	4.1	15.0	CC332257	11/3/2013
10/04/2013	09:04			O2_36	O2	6.3	6.2	-0.1	-0.8	0.9	15.0	CC134940	1/23/2015
10/04/2013	09:04			O2_36	O2	13.7	13.6	-0.1	-0.5	2.1	15.0	CC349278	5/14/2015

**Babcock & Wilcox Power Generation Group NetDAHS®**

Version 84.0

CGA Calibration Report  
Generated: 10/4/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/4/2013  
Period End: 10/4/2013  
Included Calibrations: CGA (40CFR60)

Date	Time	From	Channel	Type	Target	Actual	Diff	Error %	CGA Allowable (40CFR60)	Bottle ID	Expiry Date
10/04/2013	08:24	3	02_36	02	6.3	6.2	-0.1	-0.8	15.0	CC34940	1/23/2015
10/04/2013	08:24	3	02_36	02	13.7	13.6	-0.1	-0.5	15.0	CC349278	5/14/2015
10/04/2013	07:42	3	02_36	02	6.3	6.2	-0.1	-0.8	15.0	CC134940	1/23/2015
10/04/2013	07:42	3	02_36	02	13.7	13.6	-0.1	-0.7	15.0	CC349278	5/14/2015

FAIL - Difference Error > Regulations Allow  
TARG = Invalid Target (not within regulatory specs)  
RDG = Reading exceeds "Range of Analyzer"  
@ Bottle is within 7 days of expiration  
# Bottle has Expired - Must be Replaced

Absolute Average Diff and Absolute(Target - Average Reading)/Target) \* 100

Channel	Diff	Target	Diff	Target
COHigh_36	39.7	3.2%	42.7	1.5%
COLow_36	0.3	1.0%	0.2	0.4%
NOxHigh_36	5.2	2.5%	4.9	1.2%
NOxLow_36	0.2	1.4%	0.4	1.5%
O2_36	0.1	0.8%	0.1	0.6%

Performance Specification

Channel	Diff	Target	Diff	Target
COHigh_36	39.7	3.2%	42.7	1.5%
COLow_36	0.3	1.0%	0.2	0.4%
NOxHigh_36	5.2	2.5%	4.9	1.2%
NOxLow_36	0.2	1.4%	0.4	1.5%
O2_36	0.1	0.8%	0.1	0.6%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target  
AltPerf: [Part60 CGA O2] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm

Title: \_\_\_\_\_ Signature: Joseph W. Wilcox Date: 10/4/2013

Title: Analyzer Supervisor Signature: Michael J. Ben Date: 10/4/13

Linearity Calibration Report  
Generated: 10/4/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/4/2013  
Period End: 10/4/2013  
Included Calibrations: Linearity (40CFR75)

Range of Analyzers:

Span of Analyzers:

O2_36	O2	0.00	25.00 %O2	O2_36	O2	0.00	25.00 %O2
COHigh_36	CO	0.00	100.00 ppm	COHigh_36	CO	0.00	100.00 ppm
COHigh_36	CO	0	5000 ppm	COHigh_36	CO	0	5000 ppm
NOxLow_36	NOx	0.00	50.00 ppm	NOxLow_36	NOx	0.00	50.00 ppm
NOxHigh_36	NOx	0.0	700.0 ppm	NOxHigh_36	NOx	0.0	700.0 ppm

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%	Bottle ID	Expire Date
10/04/2013	09:04	COHigh_36	CO	1236.000	1276.000	40.000	- N/A -	- N/A -	- N/A -	CG174081	11/3/2013
10/04/2013	09:04	COHigh_36	CO	2810.000	2854.000	44.000	- N/A -	- N/A -	- N/A -	CG332257	1/19/2014
10/04/2013	09:04	COHigh_36	CO	4505.000	4651.000	146.000	- N/A -	- N/A -	- N/A -	CC260699	8/23/2016
10/04/2013	08:24	COHigh_36	CO	1236.000	1276.000	40.000	- N/A -	- N/A -	- N/A -	CG174083	11/3/2013
10/04/2013	08:24	COHigh_36	CO	2810.000	2854.000	44.000	- N/A -	- N/A -	- N/A -	CG332257	1/19/2014
10/04/2013	08:24	COHigh_36	CO	4505.000	4649.000	144.000	- N/A -	- N/A -	- N/A -	CC260699	8/23/2016
10/04/2013	07:42	COHigh_36	CO	1236.000	1275.000	39.000	- N/A -	- N/A -	- N/A -	CG174083	11/3/2013
10/04/2013	07:42	COHigh_36	CO	2810.000	2850.000	40.000	- N/A -	- N/A -	- N/A -	CG332257	1/19/2014
10/04/2013	07:42	COHigh_36	CO	4505.000	4645.000	140.000	- N/A -	- N/A -	- N/A -	CC260699	8/23/2016
10/04/2013	09:04	COLow_36	CO	24.900	24.730	-0.170	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
10/04/2013	09:04	COLow_36	CO	54.430	54.690	0.260	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/04/2013	09:04	COLow_36	CO	91.410	91.710	0.300	- N/A -	- N/A -	- N/A -	CC262188	5/20/2021
10/04/2013	08:24	COLow_36	CO	24.900	24.630	-0.270	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
10/04/2013	08:24	COLow_36	CO	54.430	54.660	0.230	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/04/2013	08:24	COLow_36	CO	91.410	91.660	0.250	- N/A -	- N/A -	- N/A -	CC262188	5/20/2021
10/04/2013	07:42	COLow_36	CO	24.900	24.580	-0.320	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
10/04/2013	07:42	COLow_36	CO	54.430	54.600	0.170	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/04/2013	07:42	COHigh_36	CO	179.700	179.500	0.090	- N/A -	- N/A -	- N/A -	CC262188	5/20/2021
10/04/2013	09:04	NOxHigh_36	NOx	395.300	184.600	4.900	2.7	8.985	5.0	SG9148157	5/2/2014
10/04/2013	09:04	NOxHigh_36	NOx	638.400	400.200	4.900	1.2	19.765	5.0	SG9113406BAL	1/11/2014
10/04/2013	09:04	NOxHigh_36	NOx	179.700	635.000	-3.400	-0.5	31.920	5.0	CC232893	8/26/2021
10/04/2013	08:24	NOxHigh_36	NOx	395.300	185.000	5.300	2.9	8.985	5.0	SG9148157	5/2/2014
10/04/2013	08:24	NOxHigh_36	NOx	638.400	400.300	5.000	1.3	19.765	5.0	SG9113406BAL	1/11/2014
10/04/2013	08:24	NOxHigh_36	NOx	179.700	633.800	-4.600	-0.7	31.920	5.0	CC232893	8/26/2021
10/04/2013	07:42	NOxHigh_36	NOx	395.300	185.000	5.300	2.9	8.985	5.0	SG9148157	5/2/2014
10/04/2013	07:42	NOxHigh_36	NOx	638.400	400.000	4.700	1.2	19.765	5.0	SG9113406BAL	1/11/2014
10/04/2013	07:42	NOxHigh_36	NOx	179.700	635.100	-3.300	-0.5	31.920	5.0	CC232893	8/26/2021

Babcock & Wilcox Power Generation Group NetDMS®

Version 81.0

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Linearity Calibration Report  
Generated: 10/4/2013

Period Start: 10/4/2013  
Period End: 10/4/2013  
Included Calibrations: Linearity (40CFR75)

Date	Time	Channel	Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	Bottle ID	Expire Date
10/04/2013	09:04	NOxLow_36	NOx	12.300	12.310	-0.190	-1.6	0.625	CC174093	11/3/2013
10/04/2013	09:04	NOxLow_36	NOx	27.510	27.080	-0.430	-1.5	1.375	CC332257	1/19/2014
10/04/2013	09:04	NOxLow_36	NOx	45.430	44.790	-0.640	-1.3	2.272	CC260699	8/23/2016
10/04/2013	08:24	NOxLow_36	NOx	12.500	12.350	-0.150	-0.8	0.625	CC174083	11/3/2012
10/04/2013	08:24	NOxLow_36	NOx	27.510	27.120	-0.390	-1.5	1.375	CC332257	1/19/2014
10/04/2013	08:24	NOxLow_36	NOx	45.430	44.720	-0.710	-1.5	2.272	CC260699	8/23/2016
10/04/2013	07:42	NOxLow_36	NOx	12.500	12.370	-0.180	-1.6	0.625	CC174083	11/3/2013
10/04/2013	07:42	NOxLow_36	NOx	27.510	27.090	-0.420	-1.5	1.375	CC332257	1/19/2014
10/04/2013	07:42	NOxLow_36	NOx	45.430	44.800	-0.630	-1.3	2.272	CC260699	8/23/2016
10/04/2013	09:04	O2_36	O2	6.260	6.210	-0.050	-1.6	0.313	CC134940	1/23/2015
10/04/2013	09:04	O2_36	O2	13.720	13.650	-0.070	-0.7	0.686	CC349278	5/14/2015
10/04/2013	09:04	O2_36	O2	20.990	20.860	-0.130	-0.5	1.049	CC262188	5/20/2021
10/04/2013	08:24	O2_36	O2	6.260	6.210	-0.050	-1.6	0.313	CC134940	1/23/2015
10/04/2013	08:24	O2_36	O2	13.720	13.650	-0.070	-0.7	0.686	CC349278	5/14/2015
10/04/2013	08:24	O2_36	O2	20.990	20.860	-0.130	-0.5	1.049	CC262188	5/20/2021
10/04/2013	07:42	O2_36	O2	6.260	6.210	-0.050	-1.6	0.313	CC134940	1/23/2015
10/04/2013	07:42	O2_36	O2	13.720	13.630	-0.090	-0.7	0.866	CC349278	5/14/2015
10/04/2013	07:42	O2_36	O2	20.990	20.850	-0.140	-0.5	1.049	CC262188	5/20/2021

FAIL = Difference Error > Regulations Allow

TARG = Invalid Target (not within regulatory specs)

RDG = Reading exceeds "Range of Analyzer"

Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration

# Bottle has Expired - Must be Replaced

Babcock & Wilcox Power Generation Group NetDAH90

Linearity Calibration Report  
Generated: 10/4/2013

Company: BP Products North America, Inc.  
Plant: 2815 Indianapolis Blvd.  
City/St: Whiting, IN 46394  
Source: stack

Period Start: 10/4/2013  
Period End: 10/4/2013  
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100									
Channel			----LOW----		----MID----		----HIGH----		
			Diff	Target	Diff	Target	Diff	Target	
		Units		%	Units	%	Units	%	
COHigh_36	CO	39.667	-	N/A -	42.667	-	N/A -	143.333	-
COLow_36	CO	0.253	-	N/A -	0.220	-	N/A -	0.213	-
NOXHigh_36	NOX	5.167	2.9%		4.867	1.2%	3.767	0.6%	
NOXLow_36	NOX	0.173	1.4%		0.413	1.5%	0.660	1.5%	
O2_36	O2	0.050	0.8%		0.077	0.8%	0.133	0.6%	

Performance Specification

Channel		PASS	FAIL
COHigh_36	CO	-	N/A -
COLow_36	CO	-	N/A -
NOXHigh_36	NOX	<=5.0%	>5.0%
NOXLow_36	NOX	<=5.0%	>5.0%
O2_36	O2	<=5.0%	>5.0%

**Perf:** [Part75 Linearity NOx] Low ~ 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm  
**Perf:** [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target  
**AltPerf:** [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: Signature:: Joseph W. Little Date: 10 / 4 / 2013

Title:: Analyzer Supervisor Signature:: [Signature] Date: 10 / 4 / 13

## **Attachment D**

### **New HU CEMS Report**



Praxair Inc  
2551 Dickey Rd  
East Chicago, IN 46312

January 15, 2014

Ms. Linda Wilson  
Environmental Superintendent  
BP Products North America Inc.  
2815 Indianapolis Blvd.  
Whiting, IN 46394-0710

Re: CEM Summary Performance Report – 4<sup>th</sup> Quarter 2013

Dear Ms. Wilson,

Please find attached the Continuous Emission Monitor (CEM) summary performance reports for the New Hydrogen Unit owned by Praxair.

This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453 Significant Permit Modification (SPM) No. 089-32755-00453 issued on April 23, 2013 and reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). This report covers NO<sub>x</sub> and CO emissions from SMR 5 (HU-1) and SMR 6 (HU-2) as well as SO<sub>2</sub> emissions from the flare (HU Flare) for the period beginning on October 1, 2013 through December 31, 2013. HU flare operated continuously throughout the quarter.

The CEMS unit on SMR 5 (HU-1) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-5 on November 19, 2013.

The CEMS unit on SMR 6 (HU-2) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-6 on November 19, 2013.

The HU flare SOLA operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Relative Accuracy Test Audit (RATA) for Flare SOLA on November 19, 2013.

Monitoring requirements for HU Flare are conducted under an Alternative Monitoring Plan (AMP) approved by USEPA by means of a letter dated June 8, 2010. The AMP allows for the monitoring of total sulfur at the flare in the form of SO<sub>2</sub> instead of H<sub>2</sub>S.



Praxair Inc  
2551 Dickey Rd  
East Chicago, IN 46312

Per 40 CFR 60.7(c) and (d) and per 326 IAC 3-5-7 the following reports are attached to this cover letter:

SMR 5 (HU-1)

- NOx @ 0% O2 40 ppm at 30 day rolling average Summary Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

SMR 6 (HU-2)

- NOx @ 0% O2 40 ppm at 30 day rolling average Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

HU Flare

- SO2 152 ppm Summary Report

If you have any questions or comments about this report or the information contained with it, please contact Kiranmai Valluri at (281) 478-1564.

Sincerely,

A handwritten signature in black ink, appearing to read "A. H. Campbell", is written over a faint horizontal line.

Andrew Campbell  
Facility Manager

# SMR5-HU1 Summary Report

## NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 30 day average NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2098.8 hours

### Emission Data Summary

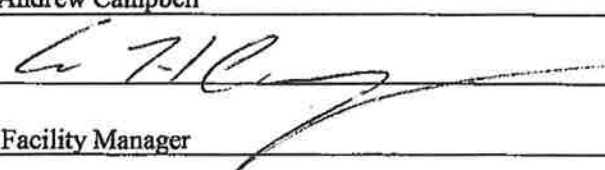
1. Duration of excess emissions in reporting period due to:	
a. Startup/shutdown	0.0 hr
b. Control equipment problems	0.0 hr
c. Process problems	0.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total duration of excess emissions.	0.0 hr
3. Percentage total duration of excess emissions of total source operating time.	0.0 %

### CEMS Performance Summary

1. CEMS downtime in reporting due to:	
a. Monitor equipment malfunctions	0.0 hr
b. Non-Monitor equipment malfunctions	0.0 hr
c. Quality assurance calibration	5.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total CEMS Downtime.	5.0 hr
3. Percentage total CEMS Downtime of total source operating time.	0.2 %

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 01/15/2014

# SMR5-HU1 Summary Report

## NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit- Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2098.8 hours

### Emission Data Summary

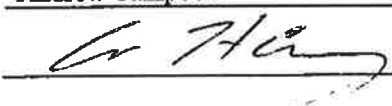
1. Duration of excess emissions in reporting period due to:	
a. Startup/shutdown	0.0 hr
b. Control equipment problems	0.0 hr
c. Process problems	0.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total duration of excess emissions.	0.0 hr
3. Percentage total duration of excess emissions of total source operating time.	0.0 %

### CEMS Performance Summary

1. CEMS downtime in reporting due to:	
a. Monitor equipment malfunctions	2.0 hr
b. Non-Monitor equipment malfunctions	0.0 hr
c. Quality assurance calibration	3.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total CEMS Downtime.	5.0 hr
3. Percentage total CEMS Downtime of total source operating time.	0.2 %

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 01/15/2014

# SMR5-HU1 Summary Report

## CO@3% Excess Emission and Monitoring System Performance

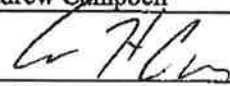
Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/13/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2098.8 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
<b>CEMS Performance Summary</b>		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	2.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	3.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.2	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

Date: 01/15/2014



Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

#### SMR5-HU1 CEMS Downtime-NOx

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
11/19/2013	10:00	11/19/2013	12:00	2.00	CGA	None
11/20/2013	6:00	11/20/2013	9:00	3.00	4x failure	recalibrated

Total hours

5

#### SMR5-HU1 CEMS Downtime-CO

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
11/19/2013	10:00	11/19/2013	12:00	2.00	CGA	None
11/20/2013	6:00	11/20/2013	9:00	3.00	4x failure	recalibrated

Total hours

5

## SMR6-HU2 Summary Report

### NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 24-hour NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	1953.5 hours

#### Emission Data Summary


1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	58.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	1.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	59.0	hr
3. Percentage total CEMS Downtime of total source operating time.	3.0	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

1/15/2014

# SMR6-HU2 Summary Report

## NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	1953.5 hours

### Emission Data Summary

1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	58.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	1.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	59.0	hr
3. Percentage total CEMS Downtime of total source operating time.	3.0	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

1/15/2014

## SMR6-HU2 Summary Report

### CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/21/2013 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	1953.5 hours

#### Emission Data Summary

1. Duration of excess emissions in reporting period due to:	
a. Startup/shutdown	0.0 hr
b. Control equipment problems	0.0 hr
c. Process problems	0.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total duration of excess emissions.	0.0 hr
3. Percentage total duration of excess emissions of total source operating time.	0.0 %

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:	
a. Monitor equipment malfunctions	58.0 hr
b. Non-Monitor equipment malfunctions	0.0 hr
c. Quality assurance calibration	1.0 hr
d. Other known causes	0.0 hr
e. Unknown causes	0.0 hr
2. Total CEMS Downtime.	59.0 hr
3. Percentage total CEMS Downtime of total source operating time.	3.0 %

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

1/15/2014

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 Excess Emission Periods: NOx 40ppm@0% 24-Hours

<u>Start Date</u>	<u>Start Time</u>	<u>End Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
-------------------	-------------------	-----------------	-----------------	----------------------	---------------	---------------------

There were no excess emission from SMR 6 (HU-2) in fourth quarter of 2013.

Total hours 0.00

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

#### SMR6-HU2 CEMS Downtime-NOx

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration</u>	<u>Reason</u>	<u>Action Taken</u>
10/18/2013	10:00	10/18/2013	13:00	3.0	Drift	Recalibrated
10/23/2013	10:00	10/23/2013	11:00	1.0	Drift	Recalibrated
10/24/2013	7:00	10/24/2013	9:00	2.0	4x failure	Repaired and recalibrated
10/28/2013	13:00	10/30/2013	12:00	47.0	4x failure	Repaired and recalibrated
10/31/2013	7:00	10/31/2013	10:00	3.0	4x failure	Repaired and recalibrated
11/19/2013	13:00	11/19/2013	14:00	1.0	CGA	None
11/21/2013	14:00	11/21/2013	16:00	2.0	4x failure	Repaired and recalibrated

Total hours 59.0

#### SMR6-HU2 CEMS Downtime-CO

<u>Date</u>	<u>Start Time</u>	<u>Date</u>	<u>End Time</u>	<u>Duration</u>	<u>Reason</u>	<u>Action Taken</u>
10/18/2013	10:00	10/18/2013	13:00	3.0	Drift	Recalibrated
10/23/2013	10:00	10/23/2013	11:00	1.0	Drift	Recalibrated
10/24/2013	7:00	10/24/2013	9:00	2.0	4x failure	Repaired and recalibrated
10/28/2013	13:00	10/30/2013	12:00	47.0	4x failure	Repaired and recalibrated
10/31/2013	7:00	10/31/2013	10:00	3.0	4x failure	Repaired and recalibrated
11/19/2013	13:00	11/19/2013	14:00	1.0	CGA	None
11/21/2013	14:00	11/21/2013	16:00	2.0	4x failure	Repaired and recalibrated

Total hours 59.0

## HU Flare Summary Report

### SO2 Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	152 ppm SO2 - NSPS J
Monitor Manufacturer:	Thermo Scientific SOLA II
Monitor Model No.:	SL-06230909
Date of Latest CEMS Certification:	11/19/2013 (RATA)
Process Unit Description:	Hydrogen Unit Flare
Total Source Operating Time:	2208.0 hours

#### Emission Data Summary


1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%

#### CEMS Performance Summary

1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	37.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	37.0	hr
3. Percentage total CEMS Downtime of total source operating time.	1.7	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: 

Title: Facility Manager

1/15/2014



Reporting period dates:	October 1, 2013 to December 31, 2013
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

#### HU Flare CEMS Downtime-SO2

<u>Start Date</u>	<u>Start Time</u>	<u>End Date</u>	<u>End Time</u>	<u>Duration (hr)</u>	<u>Reason</u>	<u>Action Taken</u>
10/10/2013	6:00	10/10/2013	8:00	2	4X Failure	Repaired and recalibrated
10/25/2013	6:00	10/25/2013	8:00	2	4X Failure	Repaired and recalibrated
11/4/2013	6:00	11/4/2013	10:00	4	4X Failure	Repaired and recalibrated
11/9/2013	6:00	11/9/2013	9:00	3	4X Failure	Repaired and recalibrated
11/12/2013	6:00	11/12/2013	10:00	4	4X Failure	Repaired and recalibrated
11/13/2013	6:00	11/13/2013	10:00	4	4X Failure	Repaired and recalibrated
11/19/2013	10:00	11/19/2013	11:00	1	4X Failure	Repaired and recalibrated
11/23/2013	6:00	11/23/2013	13:00	7	4X Failure	Repaired and recalibrated
11/24/2013	6:00	11/24/2013	11:00	5	4X Failure	Repaired and recalibrated
11/25/2013	6:00	11/25/2013	9:00	3	4X Failure	Repaired and recalibrated
12/10/2013	6:00	12/10/2013	8:00	2	4X Failure	Repaired and recalibrated

**Total hours**

**37.0**



**CONTINUOUS EMISSIONS MONITORING SYSTEM  
CYLINDER GAS AUDIT**

*Performed At*  
**Praxair, Inc.**  
**Hydrogen Unit**  
**Reformer 5 (HU 1)**  
**Reformer 6 (HU 2)**  
**Whiting, Indiana**

*Test Date*  
**November 19, 2013**

*Report No.*  
**TRC Environmental Corporation Report 202965.2000A**

*Report Submittal Date*  
**December 6, 2013**

TRC Environmental Corporation  
7521 Brush Hill Road  
Burr Ridge, Illinois 60527  
USA

T (312) 533-2042  
F (312) 533-2070



## TABLE OF CONTENTS

	Page
Certification Sheet.....	i
General Information .....	1
Audit Results .....	2
Appendix	
Cylinder Gas Audit Field Data Sheets .....	A
Computer Data .....	B
Audit Gas Certification Sheets .....	C



## **CERTIFICATION SHEET**

On January 18, 2013, TRC Environmental Corporation (TRC) acquired the assets of the GEII Emissions Testing business. All work performed prior to this date was completed under the auspices of GEII. It is TRC's intent to merge the acquired emission testing groups with TRC's Air Measurements Practice as quickly as possible. However, we will continue to operate in parallel (i.e., under existing Quality Management Systems) until we confirm that procedures are harmonized.

I certify that TRC and its subcontractors (if any) operated in conformance with the requirements of ASTM D 7036-04 during this test project. The validity of any data not generated by TRC or its subcontractors is the responsibility of the organization that provided said data.

TRC Environmental Corporation

A handwritten signature in black ink, appearing to read 'David McNulty', is written over a horizontal line.

David McNulty  
Instrumentation Engineer/Manager CEMS Services



## **CONTINUOUS EMISSIONS MONITORING SYSTEM CYLINDER GAS AUDIT**

### **1.0 INTRODUCTION**

A continuous emissions monitoring (CEM) system cylinder gas audit was performed by TRC Environmental Corporation (TRC) on November 19, 2013, at the Hydrogen Unit Reformer 5 (HU 1) and Hydrogen Unit Reformer 6 (HU 2) of Praxair Whiting plant in Whiting, Indiana. The tests were authorized by Praxair, Inc.

The CEM system was challenged three times at two audit points and the average responses were used in determining accuracy. All work was performed in accordance with 40 CFR 60, Appendix B, Performance Specification 2, and Appendix F.

### **1.1 Project Contact Information**

<b>Participants</b>		
<b>Test Facility</b>	Praxair, Inc. Praxair Hydrogen Unit Whiting, Indiana 46312	Ms. Kiranmai Valluri Environmental Manager 281-478-1564 (phone) kiranmai_valluri@praxair.com
<b>Air Emissions Testing Body (AETB)</b>	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. David McNulty Instrumentation Engineer/Manager CEM Services 312-533-2029 (phone) 312-533-2070 (fax) dmcnulty@trcsolutions.com

The tests were conducted by Mr. David McNulty of TRC.

## 2.0 SUMMARY OF RESULTS

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 5/HU 1	NO <sub>x</sub> Low	-0.07	4.09	Pass
	NO <sub>x</sub> High	-0.73	0.02	Pass
	CO Low	-0.67	1.61	Pass
	CO High	0.59	0.16	Pass
	O <sub>2</sub>	3.96	5.25	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 6/HU 2	NO <sub>x</sub> Low	5.30	3.19	Pass
	NO <sub>x</sub> High	-1.14	0.14	Pass
	CO Low	4.00	2.52	Pass
	CO High	3.09	2.04	Pass
	O <sub>2</sub>	-2.53	1.18	Pass

## APPENDIX

||| 2 2

||| 2 2

## Appendix A: Cylinder Gas Audit Field Data Sheets

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 19, 2013
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting, IN
Project Number:	202985.0002A		
Auditor:	David McNulty	Representing:	TRC Environmental
Attendees:		Representing:	

Type: <u>NOX Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date:		7-May-15	26-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		5.1	11.9
CEMS Response 2:		4.9	11.4
CEMS Response 3:		4.9	11.3
Average CEMS Response:		5.0	11.5
Accuracy:		-0.07%	4.08%
Absolute Difference:		0.0	0.6

Type: <u>CO Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3770</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date:		7-May-15	26-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		5	10.99
CEMS Response 1:		5.0	11.3
CEMS Response 2:		4.9	11.1
CEMS Response 3:		5.0	11.1
Average CEMS Response:		5.0	11.2
Accuracy:		-0.87%	1.61%
Absolute Difference:		0.0	0.2

Comments:

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-80% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 19, 2013
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting, IN
Project Number:	202985.0002A		
Auditor:	David McNulty	Representing:	TRC Environmental
Attendees:		Representing:	

Type: <u>NO<sub>x</sub> High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDAP</u>	Serial Number: <u>ENDAP-3770</u>		
	Full Scale Value: <u>200 ppm</u>		
** Audit Range (ppm or %):		40-80	100-120
Cylinder ID Number:		SX47405	SX48805
Certification Expiration Date:		19-Feb-15	19-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		49.0	110.6
CEMS Response 2:		49.3	110.0
CEMS Response 3:		49.2	110.0
Average CEMS Response:		49.2	110.2
Accuracy:		-0.73%	0.02%
Absolute Difference:		0.4	0.0

Type: <u>CO High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDAP</u>	Serial Number: <u>ENDAP-3770</u>		
	Full Scale Value: <u>100 ppm</u>		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48805
Certification Expiration Date:		19-Feb-15	19-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.5	55.0
CEMS Response 2:		25.5	55.3
CEMS Response 3:		25.5	55.3
Average CEMS Response:		25.5	55.2
Accuracy:		0.59%	0.16%
Absolute Difference:		0.1	0.1

Comments:

### Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

### Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

### \*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

### Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 19, 2013
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting, IN
Project Number:	202965.0002A	Representing:	TRC Environmental
Auditor:	David McNulty	Representing:	
Attendees:			

Type: <u>O<sub>2</sub></u>	Manufacturer: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDAP</u>	Serial Number: <u>ENDAP-3770</u>		
	Full Scale Value: <u>25%</u>		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0031709
Certification Expiration Date:		6-Feb-15	25-Oct-20
Certification Type:		Protocol 1	Protocol 1
Certified Value		5.13	9.86
CEMS Response 1:		5.3	10.4
CEMS Response 2:		5.4	10.3
CEMS Response 3:		5.3	10.4
Average CEMS Response:		5.3	10.4
Accuracy:		3.98%	5.25%
Absolute Difference:		0.2	0.5

Comments:

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date: Fourth Quarter  
Client: Praxair  
Unit: SMR6-HU2  
Project Number: 202865.0002A  
Auditor: David McNulty  
Attendees: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date of Audit: November 19, 2013  
Plant Name: Praxair Whiting  
Location: Whiting, IN  
Representing: TRC Environmental  
Representing: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Type: <u>NOX Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date:		7-May-15	26-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		5.8	11.7
CEMS Response 2:		5.0	11.4
CEMS Response 3:		4.9	11.2
Average CEMS Response:		5.2	11.4
Accuracy:		5.30%	3.19%
Absolute Difference:		0.3	0.4

Type: <u>CO Low</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>20 ppm</u>		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date:		7-May-15	26-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		5	10.99
CEMS Response 1:		5.3	11.4
CEMS Response 2:		5.1	11.2
CEMS Response 3:		5.2	11.2
Average CEMS Response:		5.2	11.3
Accuracy:		4.00%	2.52%
Absolute Difference:		0.2	0.3

Comments:

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$A_D$  = Absolute Value ( $C_a - C_m$ )

Where:

$A$  = Accuracy of the CEMS in percent

$A_D$  = Absolute difference between the Audit Value and the mean response

$C_m$  = Average CEMS response during audit in units of appropriate concentration

$C_a$  = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is  $\pm 15$  percent of the average audit value, or the absolute difference is  $\pm 5$  ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 19, 2013
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting, IN
Project Number:	202965.0002A	Representing:	TRC Environmental
Auditor:	David McNulty	Representing:	
Attendees:			

Type: <u>NO<sub>x</sub> High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>200 ppm</u>		
** Audit Range (ppm or %):		40-60	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date:		19-Feb-15	19-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		48.5	111.4
CEMS Response 2:		49.3	109.8
CEMS Response 3:		49.1	109.8
Average CEMS Response:		49.0	110.3
Accuracy:		-1.14%	0.14%
Absolute Difference:		0.6	0.2

Type: <u>CO High</u>	Manufacture: <u>Horiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDA/P</u>	Serial Number: <u>ENDA/P-3771</u>		
	Full Scale Value: <u>100 ppm</u>		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date:		19-Feb-15	19-Feb-15
Certification Type:		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		26.0	55.9
CEMS Response 2:		26.2	56.4
CEMS Response 3:		26.2	56.4
Average CEMS Response:		26.1	56.2
Accuracy:		3.09%	2.04%
Absolute Difference:		0.8	1.1

Comments:

### Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$A_D$  = Absolute Value  $(C_a - C_m)$

Where:

$A$  = Accuracy of the CEMS in percent

$A_D$  = Absolute difference between the Audit Value and the mean response

$C_m$  = Average CEMS response during audit in units of appropriate concentration

$C_a$  = Certified audit value in units of appropriate concentration

### Acceptance Criteria:

The audit passes if the accuracy is  $\pm 15$  percent of the average audit value, or the absolute difference is  $\pm 5$  ppm, whichever is greater.

### \*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 19, 2013
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting, IN
Project Number:	202965.0002A		
Auditor:	David McNulty	Representing:	TRC Environmental
Attendees:		Representing:	

Type: <u>O<sub>2</sub></u>	Manufacturer: <u>Honiba</u>	Audit Point 1	Audit Point 2
Model: <u>ENDAP</u>	Serial Number: <u>ENDAP-3771</u>		
	Full Scale Value: <u>25%</u>		
** Audit Range (ppm or %):		4-8%	8-12%
Cylinder ID Number:		FL-0000282	EB0031709
Certification Expiration Date:		6-Feb-15	25-Oct-20
Certification Type:		Protocol 1	Protocol 1
Certified Value		5.13	9.85
CEMS Response 1:		5.0	10.0
CEMS Response 2:		5.0	9.9
CEMS Response 3:		5.0	10.0
Average CEMS Response:		5.0	10.0
Accuracy:		-2.53%	1.18%
Absolute Difference:		0.1	0.1

Comments:

Calculations:

$$A = (C_m - C_a) / C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A<sub>D</sub> = Absolute difference between the Audit Value and the mean response

C<sub>m</sub> = Average CEMS response during audit in units of appropriate concentration

C<sub>a</sub> = Certified audit value in units of appropriate concentration

Acceptance Criteria:

The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

\*\*Audit Point Criteria:

SO<sub>2</sub>, NO<sub>x</sub>, CO, H<sub>2</sub>S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O<sub>2</sub>

Audit Point 1 4-6%

Audit Point 2 8-12%

CO<sub>2</sub>

Audit Point 1 5-8%

Audit Point 2 10-14%

## Appendix B: Computer Data

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
 LOCATION: Whiting, IN  
 SOURCE: SMRS-HUT  
 CENS ID NO.: P-3770  
 DATE CREATED: 11/19/2013 @ 10:13  
 PERIOD: 11/19/2013 @ 09:45 - 11/19/2013 @ 10:12

ONE MINUTE SUMMARY

DATE	MM/DD/YY HH:MM	O2 (%)
11/19/13 09:45	5.2	5.2
11/19/13 09:46	5.3	5.3
11/19/13 09:47	5.3	5.3
11/19/13 09:48	6.4	6.4
11/19/13 09:49	14.7	14.7
11/19/13 09:50	10.4	10.4
11/19/13 09:51	10.3	10.3
11/19/13 09:52	10.4	10.4
11/19/13 09:53	10.1	10.1
11/19/13 09:54	5.7	5.7
11/19/13 09:55	5.2	5.2
11/19/13 09:56	5.4	5.4
11/19/13 09:57	5.4	5.4
11/19/13 09:58	5.6	5.6
11/19/13 09:59	10.2	10.2
11/19/13 10:00	10.2	10.2
11/19/13 10:01	10.3	10.3
11/19/13 10:02	10.3	10.3
11/19/13 10:03	6.3	6.3
11/19/13 10:04	5.5	5.5
11/19/13 10:05	5.3	5.3
11/19/13 10:06	5.3	5.3
11/19/13 10:07	5.5	5.5
11/19/13 10:08	4.2	4.2
11/19/13 10:09	10.1	10.1
11/19/13 10:10	10.4	10.4
11/19/13 10:11	10.0	10.0
11/19/13 10:12	10.2	10.2

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
LOCATION: Whistler IN  
SOURCE: SMRS-HUL  
CENS ID NO.: 73776  
DATE CREATED: 11/19/2013 @ 10:43  
PERIOD: 11/19/2013 @ 10:12 - 11/19/2013 @ 10:44

ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	NOX (PPM)	CO (PPM)
11/19/13	10:12		0.5	0.1
11/19/13	10:13		29.7	34.2
11/19/13	10:14		33.6	25.4
11/19/13	10:15		48.3	25.4
11/19/13	10:16		48.9	25.5
11/19/13	10:17		49.0	25.5
11/19/13	10:18		46.4	12.1
11/19/13	10:19		84.4	3.0
11/19/13	10:20		160.0	39.7
11/19/13	10:21		113.6	53.4
11/19/13	10:22		110.8	54.7
11/19/13	10:23		110.8	55.0
11/19/13	10:24		110.8	54.0
11/19/13	10:25		83.2	50.5
11/19/13	10:26		51.1	25.6
11/19/13	10:27		49.5	25.5
11/19/13	10:28		49.3	25.5
11/19/13	10:29		49.7	31.4
11/19/13	10:30		109.5	31.1
11/19/13	10:31		110.0	55.3
11/19/13	10:32		110.3	55.3
11/19/13	10:33		89.8	36.4
11/19/13	10:34		49.4	25.5
11/19/13	10:35		49.1	25.5
11/19/13	10:36		49.2	25.5
11/19/13	10:37		49.1	25.6
11/19/13	10:38		40.9	69.2
11/19/13	10:39		66.3	47.8
11/19/13	10:40		109.5	55.3
11/19/13	10:41		110.0	55.3
11/19/13	10:42		110.0	55.3
11/19/13	10:43		MISS	MISS
11/19/13	10:44		MISS	MISS

# ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: Prexair  
 LOCATION: WHITING, IN  
 SOURCE: SMRS-HU1  
 CENS ID NO.: R-3220  
 DATE CREATED: 11/19/2013 @ 11:51  
 PERIOD: 11/19/2013 @ 11:25 - 11/19/2013 @ 11:50

## ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	NOX-L (PPM)-MC	CO-L (PPM)-MC
11/19/13	11:25		11.6-00	1.8-00
11/19/13	11:26		9.2-00	10.4-00
11/19/13	11:27		5.6-00	9.1-00
11/19/13	11:28		7.5-00	5.5-00
11/19/13	11:29		5.5-00	5.1-00
11/19/13	11:30		5.1-00	5.0-00
11/19/13	11:31		7.0-00	9.6-00
11/19/13	11:32		7.4-00	9.1-00
11/19/13	11:33		12.7-00	12.0-00
11/19/13	11:34		12.3-00	11.5-00
11/19/13	11:35		11.9-00	11.3-00
11/19/13	11:36		11.4-00	7.7-00
11/19/13	11:37		6.2-00	4.9-00
11/19/13	11:38		4.9-00	4.9-00
11/19/13	11:39		4.9-00	4.9-00
11/19/13	11:40		5.4-00	6.1-00
11/19/13	11:41		10.6-00	11.0-00
11/19/13	11:42		12.4-00	11.1-00
11/19/13	11:43		11.4-00	11.1-00
11/19/13	11:44		10.6-00	9.3-00
11/19/13	11:45		5.5-00	5.0-00
11/19/13	11:46		5.0-00	4.9-00
11/19/13	11:47		4.9-00	5.0-00
11/19/13	11:48		8.2-00	9.4-00
11/19/13	11:49		12.3-00	11.1-00
11/19/13	11:50		11.3-00	11.1-00

## REPORT SUMMARY

	NOX-L (PPM)	CO-L (PPM)
AVG:	8.4	8.0
TOTAL:	2.187E2	2.081E2

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

# ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: BRANIFF  
 LOCATION: WATKINS  
 SOURCE: SMRG-HU2  
 CEMS IE NO.: P-3771  
 DATE CREATED: 11/19/2013 @ 13:16  
 PERIOD: 11/19/2013 @ 12:55 - 11/19/2013 @ 13:15

## ONE MINUTE SUMMARY

DATE	MM/DD/YY	HH:MM	O2 (%)
11/19/13	12:55		0.9
11/19/13	12:56		5.0
11/19/13	12:57		5.1
11/19/13	12:58		5.0
11/19/13	12:59		13.5
11/19/13	13:00		10.5
11/19/13	13:01		10.0
11/19/13	13:02		10.0
11/19/13	13:03		8.1
11/19/13	13:04		5.0
11/19/13	13:05		4.9
11/19/13	13:06		7.7
11/19/13	13:07		9.9
11/19/13	13:08		9.9
11/19/13	13:09		7.4
11/19/13	13:10		5.0
11/19/13	13:11		5.0
11/19/13	13:12		8.6
11/19/13	13:13		10.1
11/19/13	13:14		10.0
11/19/13	13:15		18.0

## REPORT SUMMARY

O2 (%)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

# ONE MINUTE SYSTEM REPORT

PAGE 1

COMPANY NAME: PRAXAIR  
 LOCATION: WHITTING IN  
 SOURCE: SNRG-HU2  
 CEMS ID NO.: P-3771  
 DATE CREATED: 11/19/2013 @ 13:39  
 PERIOD: 11/19/2013 @ 13:15 - 11/19/2013 @ 13:38

## ONE MINUTE SUMMARY

DATE	MM/DD/YY HH:MM	NOX (PPM)	CO (PPM)
11/19/13	13:15	1.3	1.1
11/19/13	13:16	0.5	3.1
11/19/13	13:17	94.7	98.9
11/19/13	13:18	47.8	26.0
11/19/13	13:19	48.5	26.0
11/19/13	13:20	48.7	25.8
11/19/13	13:21	125.5	39.5
11/19/13	13:22	111.4	55.9
11/19/13	13:23	110.4	56.2
11/19/13	13:24	89.5	37.3
11/19/13	13:25	49.3	26.2
11/19/13	13:26	49.1	26.7
11/19/13	13:27	80.8	50.7
11/19/13	13:28	109.9	56.4
11/19/13	13:29	109.8	56.4
11/19/13	13:30	110.0	52.1
11/19/13	13:31	49.8	26.3
11/19/13	13:32	49.1	26.2
11/19/13	13:33	49.1	26.2
11/19/13	13:34	49.0	26.2
11/19/13	13:35	68.3	44.7
11/19/13	13:36	109.3	56.4
11/19/13	13:37	109.8	56.4
11/19/13	13:38	MISS	
REPORT SUMMARY			

NOX  
(PPM)

CO  
(PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair  
LOCATION: White Plains, NY  
SOURCE: SMR6-HU2  
CENS ID NO.: P-3771  
DATE CREATED: 11/19/2013 @ 14:29  
PERIOD: 11/19/2013 @ 14:06 - 11/19/2013 @ 14:28

ONE MINUTE SUMMARY

DATE	NOX-L (PPM)	CO-L (PPM)
11/19/13 14:06	7.3	11.1
11/19/13 14:07	7.1	8.9
11/19/13 14:08	5.8	5.3
11/19/13 14:09	5.4	6.6
11/19/13 14:10	8.3	9.2
11/19/13 14:11	8.4	11.0
11/19/13 14:12	12.7	11.7
11/19/13 14:13	11.7	11.4
11/19/13 14:14	11.2	10.5
11/19/13 14:15	6.3	5.6
11/19/13 14:16	5.0	5.1
11/19/13 14:17	4.9	5.1
11/19/13 14:18	7.0	8.3
11/19/13 14:19	11.4	11.2
11/19/13 14:20	11.2	11.2
11/19/13 14:21	9.2	7.8
11/19/13 14:22	5.0	5.1
11/19/13 14:23	4.9	5.1
11/19/13 14:24	4.9	5.2
11/19/13 14:25	8.2	9.5
11/19/13 14:26	11.3	11.2
11/19/13 14:27	11.3	11.2
11/19/13 14:28	11.2	11.2

REPORT SUMMARY

NOX-L (PPM)

CO-L (PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

## **Appendix C: Audit Gas Certification Sheets**

**MATHESON**

The Gas Professionals

1700 Scepter Rd  
Waverly, TN 37185  
931-296-3357**Certificate of Analysis - EPA Protocol Mixtures**Customer: TRC ENVIRONMENTAL CORP.  
7521 BRUSH HILL RD  
BURR RIDGE, IL 60527

Customer PO#: GEE292

Cylinder Number: CC177329

Protocol:

Reference #:

Lot#:

G1

626623-01

9303605309

Cylinder Pressure: 1900psig

Last Analysis Date: 5/7/2013

Expiration Date: 5/7/2015

**REPLICATE RESPONSES**Component: Carbon Monoxide  
Certified Conc: 5.00ppm +/- 0.54% REL

Date: 5/7/2013

5.01

5.00

5.00

Component: Nitric Oxide  
Certified Conc: 4.97ppm +/- 1.25% REL

Date: 4/29/2013

Date: 5/6/2013

4.96

4.95

4.97

4.98

4.98

4.97

NOx: 5.5ppm Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**Component: Carbon Monoxide  
Reference Standard: GMIS  
Cylinder #: ND22576  
Concentration: 9.34ppm  
Exp. Date: 7/10/2014Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: AN11101  
Concentration: 18.98ppm  
Exp. Date: 6/17/2017**CERTIFICATION INSTRUMENTS**Component: Carbon Monoxide  
Make/Model: Thermo 48i-TLE  
Serial Number: 903034427  
Measurement Principle: NDIR  
Last Calibration: 5/7/2013Component: Nitric Oxide  
Make/Model: Horiba CLA-510S  
Serial Number: FRJ8FDME  
Measurement Principle: Chemi  
Last Calibration: 4/11/2013Notes: Carbon Monoxide GMIS CERTIFIED USING SRM STANDARD.  
CYLINDER# FF30774

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D82013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst:

Julie Higgins

Date: 5/8/2013

**MATHESON**

ask...The Gas Professionals™

1700 Scepter Rd  
Waverly, TN 37185  
931-298-3367**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE Energy Management SVCS Inc

Customer PO#:

	Protocol:	Reference #:	Lot#:
Cylinder Number:	G1	T180909-5	9303604675
Cylinder Pressure:			
Last Analysis Date:			
Expiration Date:			

**REPLICATE RESPONSES**

Component:	Carbon Monoxide	Date:	2/12/2013		
			10.97		
Certified Conc:	10.99 ppm +/- 1% REL		11.03		
			10.92		
Component:	Nitric Oxide	Date:	2/19/2013	Date:	2/26/2013
			11.18		11.11
Certified Conc:	11.08 ppm +/- 1% REL		11.19		10.99
			11.02		10.96
NOx:	11.79 ppm	Reference Only			

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	SRM	Reference Standard:	NTRM
Cylinder #:	CALD17991	Cylinder #:	ND43269
Concentration:	98.85 ppm	Concentration:	98.17 ppm
Exp. Date:	1/2/2017	Exp. Date:	9/20/2015

**CERTIFICATION INSTRUMENTS**

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	Horiba VIA-510	Make/Model:	Antaris IGS
Serial Number:	RL77Y00G	Serial Number:	AKS1000151
Measurement Principle:	NDIR	Measurement Principle:	FTIR
Last Calibration:	1/23/2013	Last Calibration:	2/7/2013

**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.  
U.S. EPA Vendor ID No.: D82013 PGVP Participation Date: 01/01/13; PGVP Renewal Date: 12/31/13

Analyst:

Roman Khidekel

Date: 2/27/2013

**MATHESON**

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1700 Scepter Rd  
Waverly, TN 37185  
831-298-3357**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE ENERGY MANAGEMENT SVCS INC.

Customer PO#:

Cylinder Number: SX47405  
Cylinder Pressure: 1900 PSIG  
Last Analysis Date: 2/19/2013  
Expiration Date: 2/19/2015

Protocol: G1 Reference #: 822800 Lot#: 8303804678

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS  
BELOW 100 PSIGComponent: Carbon Monoxide  
Certified Conc: 25.35 PPM +/- 1% RELDate: 2/12/2013  
25.34  
25.34  
25.37Component: Nitric Oxide  
Certified Conc: 49.53 PPM +/- 1% RELDate: 2/12/2013 Date: 2/19/2013  
49.41 49.72  
49.42 49.57  
49.42 49.53

NOx: 50.47 PPM Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**Component: Carbon Monoxide  
Reference Standard: GMIS  
Cylinder #: SX51243  
Concentration: 207.73 PPM  
Exp. Date: 10/10/2014Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: ND43269  
Concentration: 98.17 PPM  
Exp. Date: 8/20/2015**CERTIFICATION INSTRUMENTS**Component: Carbon Monoxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 1/14/2013Component: Nitric Oxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 2/7/2013**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst:

*Saylor Wallace*

Date: 2/19/2013


**MATHESON**

est. 1899 The Gas Professionals™

1700 Scepter Rd  
Waverly, TN 37185  
931-298-3367**Certificate of Analysis - EPA Protocol Mixtures**

Customer: GE ENERGY MANAGEMENT SERVICES INC

Customer PO#:

Cylinder Number:	SX48606	Protocol:	G1	Reference #:	622600	Lot#:	9303804677
Cylinder Pressure:	1900 PSIG						
Last Analysis Date:	2/19/2013						
Expiration Date:	2/19/2015						

Component: Carbon Monoxide  
Certified Conc: 55.11 PPM +/- 1% REL

Date: 2/12/2013  
55.08  
55.09  
55.19

Component: Nitric Oxide  
Certified Conc: 110.18 PPM +/- 1% REL

Date:	2/12/2013	Date:	2/18/2013
	110.19		110.64
	109.59		110.20
	110.35		110.13

NOx: 111.46 PPM Reference Only

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS:**

Component: Carbon Monoxide  
Reference Standard: GMS  
Cylinder #: SX51243  
Concentration: 207.73%  
Exp. Date: 10/10/2014

Component: Nitric Oxide  
Reference Standard: NTRM  
Cylinder #: NO43269  
Concentration: 98.17PPM  
Exp. Date: 9/20/2015

**CERTIFICATION INSTRUMENTS**

Component: Carbon Monoxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 1/14/2013

Component: Nitric Oxide  
Make/Model: ANTARIS IGS  
Serial Number: AKS1000151  
Measurement Principle: FTIR  
Last Calibration: 2/7/2013

**Notes:**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.  
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst:



Date: 2/19/2013



**MATHESON  
TRI-GAS**

ask...The Gas Professionals™

**Certificate of Analysis - EPA Protocol Mixtures**

1650 Enterprise Parkway  
Twinsburg, Ohio 44087  
215-648-4000

Customer: GE ENERGY MANAGEMENT SVCS INC  
Cylinder Number: FL-0000282  
Cylinder pressure: 2000 psig  
Last Analysis date: 2/6/2012  
Expiration Date: 2/6/15

Protocol: G1      Reference #: 592081      Lot #: 109-26-07001

**DO NOT USE THIS CYLINDER WHEN THE  
PRESSURE FALLS BELOW 150 PSIG**

**REPLICATE RESPONSES**

Component: Oxygen  
Certified Conc: 5.13% ± 1% REL

Date: 2/6/2012      Date:  
5.13%  
5.13%  
5.13%

BALANCE GAS: Nitrogen

**REFERENCE STANDARDS**

Component: Oxygen  
SRM #: SRM-2658a  
Sample #: 72-D-40  
Cylinder #: CAL-016840  
Concentration: 9.918%

**CERTIFICATION INSTRUMENTS**

Component: Oxygen  
Make/Model: Rosemount 755  
Serial Number: 2002832  
Measurement Principle: Paramagnetic  
Last Calibration: 1/27/2012

Notes: T168024

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/01/13

Analyst:

*Philip D. Matt*

Date: 2/7/2012

**MATHESON**

ask... The Gas Professionals™

1700 Scepter Rd  
Waverly, TN 37185  
831-296-3357**Certificate of Analysis - EPA Protocol Mixtures**Customer: **GE-STOCK**Cylinder Number: **EB0031709**  
Cylinder Pressure: **1900psig**  
Last Analysis Date: **10/25/2012**  
Expiration Date: **10/25/2020**Protocol: **G1**      Reference #: **T179174-1**      Lot#: **9302604220****REPLICATE RESPONSES**Date: **10/25/2012**Component: **Oxygen****9.85**Certified Conc: **9.85% +/- 1% REL****9.85****9.86**BALANCE GAS: **Nitrogen****REFERENCE STANDARDS:**Component: **Oxygen**Reference Standard: **SRM**Cylinder #: **CAL015431**Concentration: **20.72%**Exp. Date: **1/1/2016****CERTIFICATION INSTRUMENTS**Component: **Oxygen**Make/Model: **Horiba MPA-510**Serial Number: **PGDF4TKM**Measurement Principle: **Paramagnetic**Last Calibration: **10/8/2012****Notes:** Acid rain CEM Meets Federal Register Specification Title 40 CFR 72.2  
Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm Carbon  
Monoxide<0.5ppm Sulfur Dioxide<0.1ppm THC<0.1ppm Water<1.0ppm

This Certification was performed according to EPA Traceability Protocol for Assay &amp; Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure is assigned using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D52012 PGVP Participation Date: 01/01/12 PGVP Renewal Date: 12/31/12

Analyst:

*La'Shawn Grissom*  
**La'Shawn Grissom**Date: **1/9/2013**

**Appendix 3a – FCU 500 Performance Testing  
August 2013**

# TEST REPORT

## COMPLIANCE EMISSION TEST CONSENT DECREE

FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.  
WHITING, INDIANA

PREPARED FOR:

***BP PRODUCTS NORTH AMERICA, INC.***

Whiting Refinery  
2918 Indianapolis Blvd.  
Whiting, Indiana 46394  
Phone: 219.473.3725  
E-mail: Brandon.Mik@bp.com  
Attention: Mr. Brandon Mik



ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, Illinois 50084  
Phone: 847.487.1580 Ext. 117  
Fax: 847.487.1587  
E-mail: sflaherty@arienv.com  
Steve Flaherty  
Senior Project Manager  
Source Testing Division

ARI Project No. 566-81  
ARI Proposal No. 12313  
BP Purchase Order No. 3000251393  
Test Dates: August 7 and 8, 2013



## TABLE OF CONTENTS

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<b>SECTIONS</b>	<b>PAGE</b>
REPORT CERTIFICATION	ii
Section 1 INTRODUCTION AND SUMMARY	1-1
Section 2 TESTING AND ANALYTICAL PROCEDURES	2-1
2.1 Overview	2-1
2.2 Methodology	2-1
2.2.1 Sampling Locations (USEPA Method 1)	2-1
2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)	2-1
2.2.3 Molecular Weight (USEPA Method 3)	2-1
2.2.4 Flue Gas Moisture Content (USEPA Method 4)	2-1
2.2.5 Total PM, PM <sub>10</sub> and CPM (USEPA Methods 201A and 202)	2-2
2.2.5.1 Sampling Apparatus	2-2
2.2.5.2 Sampling Procedures	2-4
2.2.5.3 Sample Recovery Procedures	2-4
2.2.5.4 Analytical Procedures	2-5
2.3 Particulate Matter Emission Rate Calculation Procedure	2-7
Section 3 PROCESS DESCRIPTION	3-1
Section 4 TEST RESULTS	4-1
<b>FIGURES</b>	
Figure 2-1 USEPA Methods 201A/202 Particulate Matter Sampling Train	2-3
<b>TABLES</b>	
Table 1-1 Summary of FCCU 500 Stack PM <sub>10</sub> and Total PM Test Results	1-2
Table 3-1 FCCU 500 Process and Stack CEMS Data Summary	3-1
Table 4-1 FCCU 500 Stack PM <sub>10</sub> and Total PM Test Results Summary	4-2
<b>APPENDICES</b>	
Appendix A Calculation Summaries	
Appendix B Field Data	
Appendix C Analytical Data	
Appendix D Calibration Data	
Appendix E Process Data	
Appendix F Test Program Qualifications	



## REPORT CERTIFICATION

---

### STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

A handwritten signature in black ink, appearing to read 'Steve Flaherty', is written over a horizontal line.

Steve Flaherty, QSTI  
Senior Project Manager, Source Testing Division  
ARI Environmental, Inc.

A handwritten signature in black ink, appearing to read 'Hank Taylor', is written over a horizontal line.

Hank Taylor, QI  
Quality Assurance Manager, Source Testing Division  
ARI Environmental, Inc.



## SECTION ONE

## Introduction and Summary

---

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on August 7 and 8, 2013.

Four approximately 120-minute test runs were conducted on the FCCU 500 stack to determine the concentrations and emission rates of total PM and PM under 10 microns (PM<sub>10</sub>) including condensable PM (CPM). The emission test was performed to fulfill the testing requirements of BP's Consent Decree.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Brandon Mik of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Rob Burton, Alex Hildreth, Tim Martch and Brett O'Leary of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.



## SECTION ONE

## Introduction and Summary

**TABLE 1-1. SUMMARY OF FCCU 500 STACK PM<sub>10</sub> AND TOTAL PM TEST RESULTS**

TEST RUN NO. :	PM-1	PM-2*	PM-3	PM-4	
TEST DATE :	8/7/2013	8/8/2013	8/8/2013	8/8/2013	
TEST TIME :	09:35-11:55	07:47-11:10	12:37-14:59	16:25-18:46	Average
<b>Filterable PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0109	0.0230	0.0123	0.0114	0.0144
mg/dscm	24.896	52.596	28.183	26.118	32.948
Emission rate (as measured)					
lb/hr	16.101	35.927	20.609	18.352	22.747
lb/1,000 lb coke burn	0.328	0.716	0.410	0.364	0.455
Prorated soot blow emission rate					
lb/hr					18.999
lb/1,000 lb coke burn					0.380
<b>Condensable PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0069	0.0061	0.0079	0.0057	0.0066
mg/dscm	15.762	13.935	18.117	13.036	15.213
Emission rate (as measured)					
lb/hr	10.194	9.519	13.249	9.160	10.530
lb/1,000 lb coke burn	0.208	0.190	0.264	0.182	0.211
Prorated soot blow emission rate					
lb/hr					10.818
lb/1,000 lb coke burn					0.217
<b>Total PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0178	0.0291	0.0202	0.0171	0.0210
mg/dscm	40.659	66.532	46.300	39.154	48.161
Emission rate (as measured)					
lb/hr	26.295	45.446	33.858	27.512	33.278
lb/1,000 lb coke burn	0.536	0.905	0.674	0.545	0.665
Prorated soot blow emission rate					
lb/hr					29.817
lb/1,000 lb coke burn					0.597
<b>Filterable &gt;PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0022	0.0032	0.0010	0.0039	0.0026
mg/dscm	5.037	7.352	2.342	8.978	5.927
Emission rate (as measured)					
lb/hr	3.257	5.022	1.713	6.309	4.075
lb/1,000 lb coke burn	0.066	0.100	0.034	0.125	0.081
Prorated soot blow emission rate					
lb/hr					3.806
lb/1,000 lb coke burn					0.076
<b>Total PM (PM<sub>10</sub> + &gt;PM<sub>10</sub>)</b>					
Concentration					
grains/dscf	0.0200	0.0323	0.0213	0.0210	0.0236
mg/dscm	45.695	73.883	48.642	48.132	54.088
Emission rate (as measured)					
lb/hr	29.552	50.468	35.571	33.820	37.353
lb/1,000 lb coke burn	0.603	1.005	0.708	0.671	0.747
Prorated soot blow emission rate					
lb/hr					33.623
lb/1,000 lb coke burn					0.673

\*A soot blow was conducted during Run No. PM-2.



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana. Testing was conducted on August 7 and 8, 2013.

Four approximately 120-minute test runs were conducted on the FCCU 500 stack to determine the concentrations and emission rates of total PM and PM<sub>10</sub> including CPM.

### 2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

#### 2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted in the FCCU 500 stack using the two (2) sampling ports provided in the 108-inch diameter stack. The sample ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

#### 2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

#### 2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion gas analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations of each collected bag. The nitrogen (N<sub>2</sub>) content was calculated as the difference.

#### 2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Methods 201A and 202 procedures described in Subsection 2.2.5.



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.2.5 Total PM, PM<sub>10</sub> and CPM (USEPA Methods 201A and 202)

Sampling was conducted in accordance with USEPA Methods 201A and 202 using an Apex Instruments, Inc. PM sampling train (see Figure 2-1). The back half impinger catch was analyzed for CPM in accordance with USEPA Method 202 procedures. The front half was analyzed for filterable PM<sub>10</sub> and >PM<sub>10</sub> to allow for calculation of total filterable PM in accordance with USEPA Method 201A procedures.

PM<sub>10</sub> was determined using the procedures of USEPA Method 201A. Sampling was conducted at a constant rate in order to achieve the 10 microns cut-rate of the cyclone separator. Dwell times at each sample point were calculated based on the stack gas velocity and gas meter temperature. Although USEPA Method 201A has an acceptable isokinetic range of 80 - 120%, this test targeted the more stringent isokinetic range of 90 - 110% to allow for the calculation of total PM following the procedural requirements of the method. Total PM was calculated as the total filterable PM plus CPM.

#### 2.2.5.1 Sampling Apparatus

Assembled by ARI personnel, the sampling train consisted of the following:

Cyclone Separator - Apex Instruments, 316 stainless steel design - 10 micron cut-rate.

Cyclone Nozzle - Stainless steel - integrated with cyclone, sized to attain PM<sub>10</sub> cut-rate.

Probe - Stainless steel with a heating system capable of maintaining a probe exit temperature of 248°F.

Pitot Tube - Type-S, attached to probe for monitoring stack gas velocity.

Heated Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 248°F ±25°F during sampling. A thermocouple was placed in the back half of the filter support in direct contact with the sample stream. A quartz fiber filter that met the requirements of USEPA Method 5 was used.

Ambient Filter Holder - Unheated borosilicate glass filter with a 4-in. Teflon frit filter support, Teflon filter and a silicone rubber gasket. A thermocouple was placed in the back half of the filter holder to measure sample gas temperature by direct contact with the sample stream. Temperature was maintained between 65 and 85°F. A Teflon filter disc was placed in the filter holder.

Draft Gauge - Inclined manometer with a readability of 0.01-in. H<sub>2</sub>O in the 0 to 1-in. range and 0.1-in. H<sub>2</sub>O in the 0 to 10-in. range.

Condenser - Glass, coil type with compatible fittings.

## SECTION TWO

## Testing and Analytical Procedures

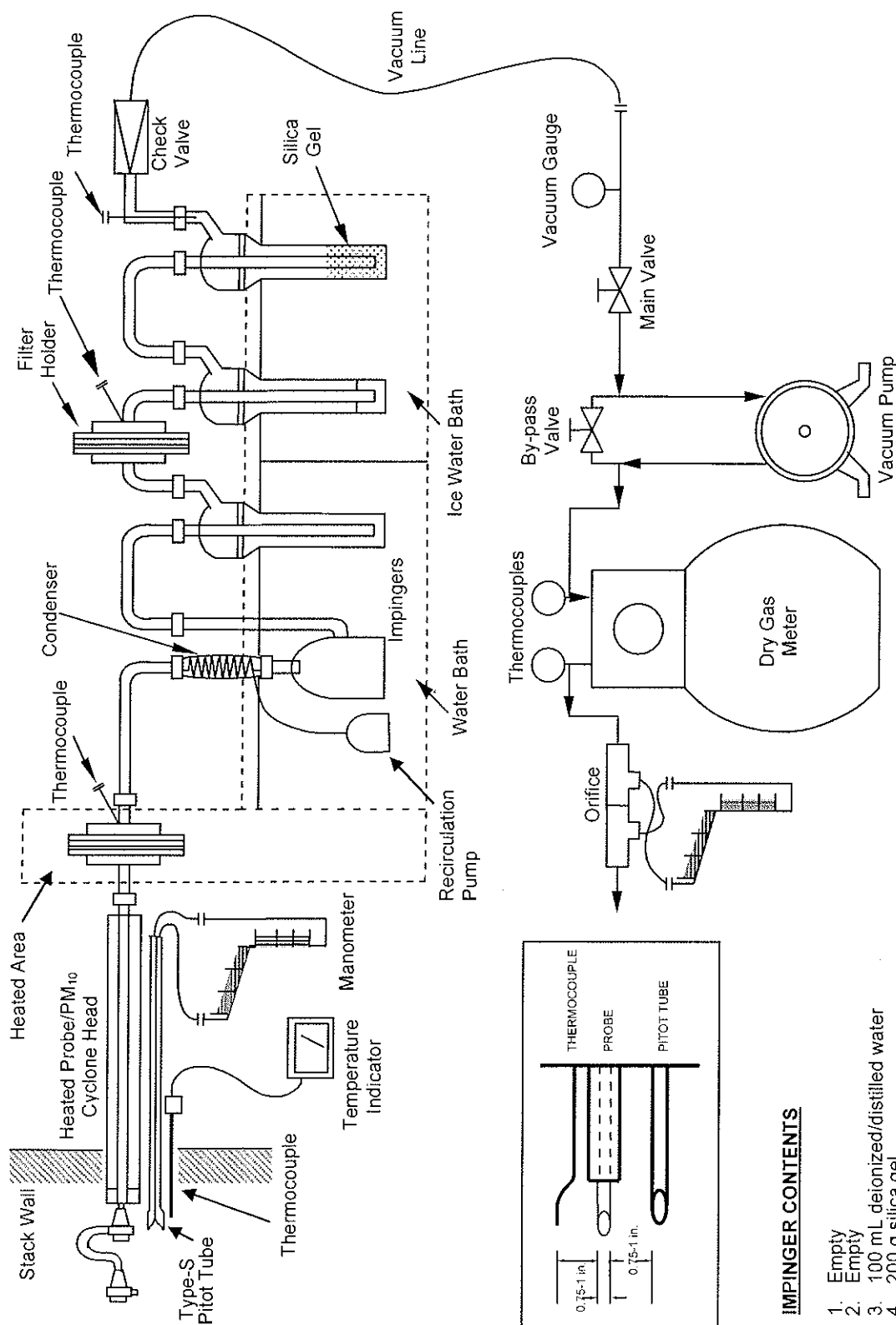


FIGURE 2-1. USEPA METHODS 201A/202 PARTICULATE MATTER SAMPLING TRAIN

## SECTION TWO

## Testing and Analytical Procedures

---

Impingers - Four (4) impingers connected in series with glass ball joints. The first impinger was a Method 23 type condenser with a condensate drop-out. The second, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second and third impingers were connected using the ambient filter holder.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with  $\pm 2$  percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within  $\pm 0.1$ -in. Hg.

### 2.2.5.2 Sampling Procedures

After the minimum number of traverse points was selected, the stack pressure, temperature, moisture and range of velocity differential pressure ( $\Delta P$ ) were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers were initially empty. The third impinger contained 100 milliliters (mL) of deionized/distilled (DI) water. The fourth impinger contained 200 grams of silica gel.

The impingers were placed in a container that had two compartments. The first two impingers were placed in the first compartment, and the third and fourth impingers were placed in the second compartment. The first compartment contained water that was circulated through the condenser to reduce the sample gas to between 65 and 85°F at the exit of the ambient filter. The second compartment contained ice water to reduce the sample gas to  $\leq 68^\circ\text{F}$  upon exiting the last impinger. Both temperatures were recorded at each traverse point interval throughout each test run.

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft<sup>3</sup>/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was again leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

### 2.2.5.3 Sample Recovery Procedures

After sampling was completed, a post-test nitrogen purge was conducted with the impingers still on ice at a rate  $\geq 14$  liters per minute for 60 minutes. Before the purge step began, the short stem of the first impinger was replaced with a long stem that was within ½-inch of the bottom of the impinger. If the stem did not extend below the water level in the impinger by at least 1 cm, a measured amount of degassed DI water was added to adjust the level.



## SECTION TWO

## Testing and Analytical Procedures

---

### Method 201A

The sample fractions were recovered as follows:

Container 1 - The filter was removed from the holder and placed in a petri dish.

Container 2 - The  $>PM_{10}$  was acetone rinsed from the cyclone cup, the internal surface of the nozzle and the outside surface of the downcomer line. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 3 - The  $\leq PM_{10}$  filterable PM was acetone rinsed from the cyclone exit tube and internal surfaces of the  $PM_{10}$  cyclone assembly, probe liner and sample exposed surfaces prior to the filter. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 4 - 150 mL of acetone was taken for blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

### Method 202 (Including Field Recovery Blank Train)

The sample fractions were recovered as follows:

Container 1 - The contents from the first two impingers were placed into a glass container. The impingers (including the short stem), connecting glassware and front-half of the ambient filter holder were quantitatively rinsed twice with DI water, and the rinse was added to this container. The liquid level was marked after the container was sealed.

Container 2 - The first two impingers (including the short stem), connecting glassware and front half of the ambient filter holder were rinsed with acetone, followed by two rinses with hexane, and placed in a glass container. The liquid level was marked after the container was sealed.

Container 3 - The ambient filter was removed and placed in a petri dish.

Containers 4 & 5 - 150 mL of DI water and hexane were taken for blank analysis. The blanks were obtained and treated in a similar manner as the contents of Containers 1 and 2.

The contents of the third impinger were weighed and discarded. The contents of the fourth impinger (silica gel) were weighed to the nearest gram.

#### 2.2.5.4 Analytical Procedures

### Method 201A

The analytical procedures followed those described in USEPA Method 201A.

## SECTION TWO

## Testing and Analytical Procedures

---

Container 1 - The filter and any loose PM were transferred from the sample container to a tared glass weighing dish, dried at 105°C for 2 to 3 hours and placed in a desiccator for 24 hours. The filter was weighed to a constant weight. The results were reported to the nearest 0.1 mg.

Containers 2 & 3 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The contents were then placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 4 - The acetone blank was transferred to a tared beaker, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

### Method 202 (Including Field Recovery Blank Train)

The analytical procedures followed those described in USEPA Method 202.

Container 1 - The liquid in this container was measured volumetrically and placed into a separatory funnel. Approximately 30 mL of hexane was added, mixed well and the lower organic phase drained off. This procedure was repeated twice, leaving a small amount of the organic/hexane phase in the separatory funnel each time to yield approximately 90 mL of organic extract. This organic extract was combined with Container 2. The aqueous fraction from Container 1 was transferred to a tared beaker, evaporated in an oven at 105°C to no less than 10 mL and allowed to air dry at ambient temperature. If a dried constant weight could not be achieved, the residue was redissolved in 100 mL of water and titrated with 0.1N ammonium hydroxide to a pH of 7.0. The aqueous phase was then evaporated in an oven at 105°C to approximately 10 mL, transferred to a pre-weighed tin, evaporated to dryness in a fume hood at ambient temperature and pressure, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the inorganic PM collected in the sampling train back half.

Container 2 - The contents of this container were combined with the organic extract from Container 1, placed in a tared beaker and evaporated at ambient temperature and pressure in a fume hood to no less than 10 mL. The beaker contents were then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the organic PM collected in the sampling train back half.

Container 3 - The ambient filter was folded in quarters and placed into a 50 mL extraction tube. Sufficient DI water was used to cover the filter. The extraction tube was placed in a sonication bath, and the water soluble material was extracted for a minimum of 2 minutes. The aqueous extract was combined with the contents of Container 1. This step was completed a total of three times. After completion of the aqueous extraction, the filter was covered with a sufficient amount of hexane. The extraction tube was then



## SECTION TWO

## Testing and Analytical Procedures

placed in a sonication bath, and the organic material was extracted for a minimum of 2 minutes. The organic extract was combined with the contents of Container 2. This step was completed a total of three times. The procedures for Container 3 were completed prior to any procedures for Containers 1 and 2.

Container 4 - The water blank was transferred to a tared beaker and evaporated to approximately 10 mL in an oven at 105°C. It was then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 5 - The hexane blank was transferred to a tared beaker and evaporated to approximately 10 mL at ambient temperature and pressure in a fume hood. It was then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

### 2.3 PARTICULATE MATTER EMISSION RATE CALCULATION PROCEDURE

Representative averaging of emission rates accommodated one 3-minute soot blowing cycle during the second test run. The following equation (excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979) was used for calculations:

$$E_{\text{pave}} = E_{\text{sbr}} \left( \frac{(A + B)S}{AR} \right) + E_{\text{nosb}} \left( \frac{R - S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{\text{pave}}$	=	Average E for daily operating time
$E_{\text{sbr}}$	=	Average E of sample(s) containing soot blowing
$E_{\text{nosb}}$	=	Average E of sample(s) with no soot blowing
A	=	Hours of soot blowing during sample(s)
B	=	Hours not soot blowing during sample(s)
R	=	Average hours of operating per 24 hours
S	=	Average hours of soot blowing per 24 hours



## SECTION THREE

## Process Description

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

**TABLE 3-1. FCCU 500 PROCESS AND STACK CEMS DATA SUMMARY**

TEST RUN NO.	PM10-1	PM10-2	PM10-3	PM10-4	Average
Total Feed Rate, BPD	80	80	80	81	80
FCCU Regenerator Coke Burn, lb/hr	49,025	50,199	50,236	50,439	49,975
Ammonia Flow to ESP, lb/hr	151	178	180	180	172
ESP Total Primary Power, KW	149	150	151	149	150
ESP Total Secondary Current, Amps	4,916	4,842	4,850	4,804	4,853
SO <sub>2</sub> , ppm @ 0% O <sub>2</sub>	3.0	2.6	2.6	2.8	2.8
NO <sub>x</sub> , ppm @ 0% O <sub>2</sub>	30.5	34.0	32.1	31.4	32.0
SO <sub>2</sub> Additive Rate, PPD	100	150	150	150	138
Ammonia Slip (Calc), ppm	8.1	9.0	9.0	9.0	8.8
Regenerator Plenum Outlet Temperature, °F	1,302	1,310	1,312	1,315	1,310
Average ESP Inlet Temperature, °F	665	661	664	667	664



## **SECTION FOUR**

## **Test Results**

---

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.



## SECTION FOUR

## Test Results

**TABLE 4-1. FCCU 500 STACK PM<sub>10</sub> AND TOTAL PM TEST RESULTS SUMMARY**

TEST RUN NO. :	PM-1	PM-2*	PM-3	PM-4	
TEST DATE :	8/7/2013	8/8/2013	8/8/2013	8/8/2013	
TEST TIME :	09:35-11:55	07:47-11:10	12:37-14:59	16:25-18:46	Average
<b>Process Data</b>					
Coke burn rate, lb/hr	49,025	50,199	50,236	50,439	49,975
<b>Stack Gas Parameters</b>					
Temperature, °F	665.0	660.6	665.2	667.7	664.6
Velocity, av. ft/sec	130.8	134.8	141.7	139.5	136.7
Volumetric flow, acfm	499,414	514,522	540,872	532,615	521,856
Volumetric flow, scfm	231,762	240,278	251,550	247,161	242,688
Volumetric flow, scfh	13,905,703	14,416,674	15,093,028	14,829,648	14,561,263
Volumetric flow, dscfm	172,630	182,333	195,202	187,560	184,431
Volumetric flow, dscfh	10,357,817	10,940,005	11,712,106	11,253,609	11,065,884
Mass flow, Mlb/hr db	830.4	879.2	938.6	901.8	887.5
Moisture, av. % vol	25.5	24.1	22.4	24.1	24.0
Molecular weight, lb/lb-mole db	30.9	31.0	30.9	30.9	30.9
Carbon Dioxide, av. % vol	17.5	17.9	17.4	17.3	17.5
Oxygen, av. % vol	2.2	2.4	2.3	2.6	2.4
<b>Particulate Sample</b>					
Time, min.	125.50	123.50	130.59	128.23	126.96
Volume, dscf	43.122	38.910	43.732	43.268	42.3
>PM <sub>10</sub> , mg	6.15	8.10	2.90	11.00	7.04
Filterable PM <sub>10</sub> , mg	30.4	58.0	34.9	32.0	38.8
Condensable PM <sub>10</sub> , mg	19.25	15.35	22.44	15.97	18.25
Total PM <sub>10</sub> , mg	49.6	73.3	57.3	48.0	57.1
Isokinetic ratio, %	106.1	92.1	91.4	95.9	96.3
D <sub>50</sub> cutpoint, µm	9.27	10.01	9.76	9.55	9.65
<b>Filterable PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0109	0.0230	0.0123	0.0114	0.0144
x 10 <sup>-6</sup> lb/dscf	1.554	3.284	1.760	1.631	2.057
mg/dscm	24.896	52.596	28.183	26.118	32.948
Emission rate (as measured)					
lb/hr	16.101	35.927	20.609	18.352	22.747
lb/1,000 lb coke burn	0.328	0.716	0.410	0.364	0.455
Prorated soot blow emission rate					
lb/hr					18.999
lb/1,000 lb coke burn					0.380
<b>Condensable PM<sub>10</sub></b>					
Concentration					
grains/dscf	0.0069	0.0061	0.0079	0.0057	0.0066
x 10 <sup>-6</sup> lb/dscf	0.984	0.870	1.131	0.814	0.950
mg/dscm	15.762	13.935	18.117	13.036	15.213
Emission rate (as measured)					
lb/hr	10.194	9.519	13.249	9.160	10.530
lb/1,000 lb coke burn	0.208	0.190	0.264	0.182	0.211
Prorated soot blow emission rate					
lb/hr					10.818
lb/1,000 lb coke burn					0.217

\*A soot blow was conducted during Run No. PM-2.



## SECTION FOUR

## Test Results

**TABLE 4-1 (CONTINUED). FCCU 500 STACK PM<sub>10</sub> AND TOTAL PM  
TEST RESULTS SUMMARY**

TEST RUN NO. :	PM-1	PM-2*	PM-3	PM-4	
TEST DATE :	8/7/2013	8/8/2013	8/8/2013	8/8/2013	
TEST TIME :	09:35-11:55	07:47-11:10	12:37-14:59	16:25-18:46	<u>Average</u>
<b><u>Total PM<sub>10</sub></u></b>					
Concentration					
grains/dscf	0.0178	0.0291	0.0202	0.0171	0.0210
x 10 <sup>-6</sup> lb/dscf	2.539	4.154	2.891	2.445	3.007
mg/dscm	40.659	66.532	46.300	39.154	48.161
Emission rate (as measured)					
lb/hr	26.295	45.446	33.858	27.512	33.278
lb/1,000 lb coke burn	0.536	0.905	0.674	0.545	0.665
Prorated soot blow emission rate					
lb/hr					29.817
lb/1,000 lb coke burn					0.597
<b><u>Filterable &gt;PM<sub>10</sub></u></b>					
Concentration					
grains/dscf	0.0022	0.0032	0.0010	0.0039	0.0026
x 10 <sup>-6</sup> lb/dscf	0.314	0.459	0.146	0.561	0.370
mg/dscm	5.037	7.352	2.342	8.978	5.927
Emission rate (as measured)					
lb/hr	3.257	5.022	1.713	6.309	4.075
lb/1,000 lb coke burn	0.066	0.100	0.034	0.125	0.081
Prorated soot blow emission rate					
lb/hr					3.806
lb/1,000 lb coke burn					0.076
<b><u>Total PM (PM<sub>10</sub> + &gt;PM<sub>10</sub>)</u></b>					
Concentration					
grains/dscf	0.0200	0.0323	0.0213	0.0210	0.0236
x 10 <sup>-6</sup> lb/dscf	2.853	4.613	3.037	3.005	3.377
mg/dscm	45.695	73.883	48.642	48.132	54.088
Emission rate (as measured)					
lb/hr	29.552	50.468	35.571	33.820	37.353
lb/1,000 lb coke burn	0.603	1.005	0.708	0.671	0.747
Prorated soot blow emission rate					
lb/hr					33.623
lb/1,000 lb coke burn					0.673

\*A soot blow was conducted during Run No. PM-2.



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## **APPENDIX A**

## **Calculation Summaries**

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## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/7/2013  
Run #: PM-1

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.5 %
Oxygen (O <sub>2</sub> ):	2.2 %
Nitrogen (N <sub>2</sub> ):	80.3 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2551
Stack Temperature (T <sub>s</sub> ):	665.0 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.5522 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.68 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.888 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.600 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.584 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 130.838 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 499,414 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 231,762 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 13,905,703 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 172,630 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 10,357,817 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, In  
**Source:** FCCU 500  
**Date:** 8/7/2013  
**Run #:** PM-1

### Data Input:

Volume metered ( $V_m$ ):	45.850 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.68 inches Hg
Meter sample rate ( $\Delta H$ ):	0.36 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	97.4 °F
Volume of moisture collected ( $V_{lc}$ ):	313.8 milliliters
Stack Temperature ( $T_s$ ):	665.0 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 43.122 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 14.771 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2551 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 25.51 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 624.7^\circ \text{ Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 753.90 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt{10^{\left( A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1693.5 \\ C = 27.65 \end{array} = 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 25.51 \%$$



# USEPA Method 201A PM<sub>10</sub> Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/7/2013  
Run #: PM-1

## Data Input

Barometric pressure (P <sub>bar</sub> ):	29.68 inches Hg	Particulate Weight:	
Stack pressure (P <sub>s</sub> ):	29.58 inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filter)	26.75 milligrams
Test length (t):	125.50 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	6.15 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1480 inches		
Sample nozzle area (A <sub>n</sub> ):	0.000119 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>4</sub> , (Container 4) (Rinse)	3.65 milligrams
Stack temperature (T <sub>s</sub> ):	665.0 °F	Total PM <sub>10</sub> front half:	30.40 milligrams
Volume metered (Vm <sub>std</sub> ):	43.122 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	130.838 feet/second	Total PM front half	36.55 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	10,357.817 dscf/hour	Total corrected PM <sub>10</sub> back half:	19.25 milligrams
Fractional Moisture content (B <sub>wd</sub> ):	0.2551		
Coke Burn Rate (R <sub>c</sub> ):	49,025 lb/hr	Total PM <sub>10</sub> weight (M <sub>p</sub> ):	49.65 milligrams
		Total PM weight (M <sub>n</sub> ):	55.80 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wd})} = 106.1 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{(0.01543 \text{ grains} \times M_n)}{Vm_{std} \text{ mg}} = 0.0200 \text{ total PM gr/dscf}$$

$$C_s = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 0.0022 \text{ >PM}_{10} \text{ gr/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 0.0109 \text{ filterable PM}_{10} \text{ gr/dscf}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 0.0089 \text{ condensible PM}_{10} \text{ gr/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 0.0178 \text{ PM}_{10} \text{ gr/dscf}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 45.695 \text{ total PM mg/dscm}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 5.037 \text{ >PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 24.896 \text{ filterable PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 15.762 \text{ condensible PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{M_n}{Vm_{std} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}} = 40.659 \text{ PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 2.853 \times 10^{-6} \text{ total PM lb/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 0.314 \times 10^{-6} \text{ >PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 1.554 \times 10^{-6} \text{ filterable PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 0.984 \times 10^{-6} \text{ condensible PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{Vm_{std} \text{ mg}} = 2.539 \times 10^{-6} \text{ PM}_{10} \text{ lb/dscf}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate:

$$E_p = C_s \times Q_{std} = 29.652 \text{ total PM lb/hr}$$

$$E_p = C_s \times Q_{std} = 3.257 \text{ >PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 16.101 \text{ filterable PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 10.194 \text{ condensible PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 26.295 \text{ PM}_{10} \text{ lb/hr}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.603 \text{ total PM lb/1000lb coke burn}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.066 \text{ >PM}_{10} \text{ lb/1000lb coke burn}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.328 \text{ filterable PM}_{10} \text{ lb/1000lb coke burn}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.208 \text{ condensible PM}_{10} \text{ lb/1000 lb coke burn}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.536 \text{ PM}_{10} \text{ lb/1000 coke burn}$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 500  
TEST DATE: 8/7/13  
RUN NUMBER: PM-1

**Data Input:**

V <sub>m</sub> :	45.850	ft <sup>3</sup>	Q <sub>s</sub> :	172.630	dscfm
γ FACTOR:	1		T <sub>s</sub> :	665.0	°F
P <sub>bar</sub> :	29.68	in.Hg	Runtime:	125.50	minutes
ΔH:	0.36	in.H <sub>2</sub> O	V <sub>s</sub> :	130.838	ft/sec
T <sub>m</sub> :	97.4	°F	P <sub>s</sub> :	29.58	in.Hg
V <sub>ic</sub> :	313.8	mL	Noz. diam:	0.148	inches
N:	0.0992		m <sub>ib</sub> :	0.40	mg
V <sub>t</sub> :	0.89	mL	m <sub>ob</sub> :	0.00	mg
m <sub>r</sub> :	20.45	mg			
m <sub>o</sub> :	0.70	mg			

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Volume of sample at standard conditions:**

$$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 43.122 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 1.50 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{ib} + m_{ob} = 0.40 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 18.95 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 19.25 \text{ mg}$$



USEPA Method 201A PM<sub>2.5</sub> Emissions  
D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/7/2013  
Run #: PM-1

**Data Input**

Stack temperature (T<sub>s</sub>): 665.0 °F  
Fractional Moisture content (B<sub>ws</sub>): 0.2551 %  
Oxygen (O<sub>2</sub>): 2.200 %  
Stack pressure (P<sub>s</sub>): 29.58 Inches Hg Abs.  
Volume metered (V<sub>m10</sub>): 43.122 dscf  
Volume of water vapor (V<sub>w10</sub>): 14.771 scf  
Molecular weight of gas, wet basis (M<sub>g</sub>): 27.600 lb/lb-mole  
Test length (θ): 125.50 minutes  
D<sub>p</sub>: 10.0 microns

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Stack gas viscosity:**

$$\mu = -150.3162 + \left( 3.4622 \times \sqrt{(T_s + 460)} \right) + \left( 3.86153 \times 10^{-6} \times (T_s + 460)^{-2} \right) + \left( 0.591123 \times (\%O_{2, \text{wet}}) \right) - \left( 91.9723 \times B_{ws} \right) + \left( 1.51761 \times 10^{-8} \times B_{ws} \times (T_s + 460)^2 \right)$$

= 286.67 micropoise

**Sample flow rate @ standard conditions:**

$$Q_{sSt} = \frac{V_{m10}}{\theta} = 0.344 \text{ dscfm}$$

**Sample flow rate through PM<sub>10</sub> cyclone:**

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left( \frac{1}{(1 - B_{ws})} \right) \times \left( \frac{[T_s + 460]}{P_s} \right)$$

= 0.994 cfm

**Calculated Reynolds Number**

$$N_{re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_g}{(T_s + 460)} \right) \times \left( \frac{Q_s}{\mu} \right)$$

= 2174

**Cunningham Correction Factor**

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{[T_s + 460]}{M_g} \right)^{0.50} \right)$$

= 1.0354

**D<sub>50</sub> cutpoint (for Cyclone I):**

$$D_{50} = \left( 0.15625 \times \left( \frac{[T_s + 460]}{(M_g \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_s} \right)^{0.7091}$$

= 9.275 μm



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.9 %
Oxygen (O <sub>2</sub> ):	2.4 %
Nitrogen (N <sub>2</sub> ):	79.7 %
Fractional Moisture Content (B <sub>wo</sub> )	0.2412
Stack Temperature (T <sub>s</sub> ):	660.6 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.6110 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.75 inches Hg
Static Pressure (S <sub>t</sub> )	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.960 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.835 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.654 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 134.796 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 514,522 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 240,278 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 14,416,674 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 182,333 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 10,940,005 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

### Data Input:

Volume metered ( $V_m$ ):	41.325 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.75 inches Hg
Meter sample rate ( $\Delta H$ ):	0.30 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	98.0 °F
Volume of moisture collected ( $V_{ic}$ ):	262.7 milliliters
Stack Temperature ( $T_s$ ):	660.6 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 38.910 \text{ dscf}$$

#### Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{ic} = 12.365 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = 0.2412 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 24.12 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) \times 0.5556) + 273 = 622.3 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 755.68 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( \frac{A \left( \frac{B}{(T_{s(°K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 6.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 24.12 \%$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

## Data Input

Barometric pressure (P <sub>bar</sub> ):	29.75 inches Hg	Particulate Weight:	
Stack pressure (P <sub>s</sub> ):	29.65 Inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	46.40 milligrams
Test length (t):	123.50 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	8.10 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1480 inches		
Sample nozzle area (A <sub>n</sub> ):	0.000119 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>3</sub> , (Container 4) (Rinse)	11.55 milligrams
Stack temperature (T <sub>s</sub> ):	660.6 °F	Total PM <sub>10</sub> front half:	57.95 milligrams
Volume metered (V <sub>mstd</sub> ):	38.910 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	134.796 feet/second	Total PM front half	66.05 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	10,940,005 dscf/hour	Total corrected PM <sub>10</sub> back half:	15.35 milligrams
Fractional Moisture content (B <sub>wo</sub> ):	0.2412		
Coke Burn Rate (R <sub>c</sub> ):	50,199 lb/hr	Total PM <sub>10</sub> weight (M <sub>n</sub> ):	73.30 milligrams
		Total PM weight (M <sub>n</sub> ):	81.40 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 92.1 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0323 \text{ total PM gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0032 \text{ >PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0230 \text{ filterable PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0061 \text{ condensible PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0291 \text{ PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 73.883 \text{ total PM mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 7.352 \text{ >PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 52.596 \text{ filterable PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 13.935 \text{ condensible PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 66.532 \text{ PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 4.613 \times 10^{-6} \text{ total PM lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.459 \times 10^{-6} \text{ >PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 3.284 \times 10^{-6} \text{ filterable PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.870 \times 10^{-6} \text{ condensible PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 4.154 \times 10^{-6} \text{ PM}_{10} \text{ lb/dscf}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate:

$$E_p = C_s^1 \times Q_{std} = 50.468 \text{ total PM lb/hr}$$

$$E_p = C_s^1 \times Q_{std} = 5.022 \text{ >PM}_{10} \text{ lb/hr}$$

$$E_p = C_s^1 \times Q_{std} = 35.927 \text{ filterable PM}_{10} \text{ lb/hr}$$

$$E_p = C_s^1 \times Q_{std} = 9.519 \text{ condensible PM}_{10} \text{ lb/hr}$$

$$E_p = C_s^1 \times Q_{std} = 45.446 \text{ PM}_{10} \text{ lb/hr}$$

$$PMI_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 1.005 \text{ total PM lb/1000lb coke burn}$$

$$PMI_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.100 \text{ >PM}_{10} \text{ lb/1000lb coke burn}$$

$$PMI_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.716 \text{ filterable PM}_{10} \text{ lb/1000lb coke burn}$$

$$PMI_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.190 \text{ condensible PM}_{10} \text{ lb/1000 coke burn}$$

$$PMI_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.905 \text{ PM}_{10} \text{ lb/1000 coke burn}$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 500  
TEST DATE: 8/8/13  
RUN NUMBER: PM-2

**Data Input:**

$V_m$ :	41.325	ft <sup>3</sup>	$Q_s$ :	182,333	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	660.6	°F
$P_{bar}$ :	29.75	in.Hg	Runtime:	123.50	minutes
$\Delta H$ :	0.30	in.H <sub>2</sub> O	$V_s$ :	134.796	ft/sec
$T_m$ :	98	°F	$P_s$ :	29.65	in.Hg
$V_{lc}$ :	262.7	mL	Noz. diam:	0.148	inches
$N$ :	0.0992		$m_{lb}$ :	0.40	mg
$V_t$ :	0.56	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	16.50	mg			
$m_o$ :	0.20	mg			

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Volume of sample at standard conditions:**

$$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 38.910 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 0.95 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{lb} + m_{ob} = 0.40 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 15.55 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{opm} = m_i + m_o - m_{fb} = 15.35 \text{ mg}$$



# USEPA Method 201A PM<sub>2.5</sub> Emissions D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

## Data Input

Stack temperature (T <sub>s</sub> ):	660.6 °F
Fractional Moisture content (B <sub>wt</sub> ):	0.2412 %
Oxygen (O <sub>2</sub> ):	2.400 %
Stack pressure (P <sub>s</sub> ):	29.65 Inches Hg Abs.
Volume metered (V <sub>mstd</sub> ):	38.910 dscf
Volume of water vapor (V <sub>wstd</sub> ):	12.365 scf
Molecular weight of gas, wet basis (M <sub>g</sub> ):	27.835 lb/lb-mole
Test length (t):	123.50 minutes
D <sub>p</sub> :	10.0 microns

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Stack gas viscosity:

$$\mu = -150.3162 + \left( 13.4622 \times \sqrt{\left( \frac{T_s + 460}{T_s + 460} \right)} \right) + \left( 3.86153 \times 10^{-5} \times (T_s + 460)^2 \right) + \left( 0.591123 \times (\%O_{2,wb}) \right) - (91.9723 \times B_{wt}) + \left( 1.51761 \times 10^{-5} \times B_{wt} \times (T_s + 460)^2 \right)$$

= 286.9 micropoise

### Sample flow rate @ standard conditions:

$$Q_{sstd} = \frac{V_{mstd}}{t} = 0.315 \text{ dscfm}$$

### Sample flow rate through PM<sub>10</sub> cyclone:

$$Q_c = \frac{29.92}{528} \times Q_{sstd} \times \left( \frac{1}{(1 - B_{wt})} \right) \times \left( \frac{(T_s + 460)}{P_s} \right)$$

= 0.889 cfm

### Calculated Reynolds Number

$$N_{Re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_g}{(T_s + 460)} \right) \times \left( \frac{Q_c}{\mu} \right)$$

= 1972

### Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \frac{(T_s + 460)}{M_g} \right)^{0.701}$$

= 1.035

### D<sub>50</sub> cutpoint (for Cyclone I):

$$D_{50} = \left( 0.15625 \times \left( \frac{(T_s + 460)}{(M_g \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_c} \right)^{0.7001}$$

= 10.013 μm

- D<sub>50</sub>



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-3

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.4 %
Oxygen (O <sub>2</sub> ):	2.3 %
Nitrogen (N <sub>2</sub> ):	80.3 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2240
Stack Temperature (T <sub>s</sub> ):	665.2 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.6948 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.75 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.876 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.992 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.654 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 141.700 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 540,872 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 251,550 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 15,093,028 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 195,202 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 11,712,106 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-3

### Data Input:

Volume metered ( $V_m$ ):	46.705 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.75 inches Hg
Meter sample rate ( $\Delta H$ ):	0.30 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	101.1 °F
Volume of moisture collected ( $V_{lc}$ ):	268.2 milliliters
Stack Temperature ( $T_s$ ):	665.2 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 43.732 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 12.624 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2240 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 22.40 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 624.8^\circ \text{ Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 755.68 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt{10^{\left( A \left( \frac{B}{(T_{s(K)} - C) \right) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1693.5 \\ C = 27.65 \end{array} = 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 22.40 \%$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-3

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.75 inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.65 Inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	30.20 milligrams
Test length (t):	130.59 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	2.90 milligrams
Sample nozzle diameter ( $D_n$ ):	0.1480 inches		
Sample nozzle area ( $A_n$ ):	0.000119 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>1</sub> , (Container 4) (Rinse)	4.70 milligrams
Stack temperature ( $T_s$ ):	665.2 °F	Total PM <sub>10</sub> front half:	34.90 milligrams
Volume metered ( $V_{mstd}$ ):	43.732 ft <sup>3</sup>		
Stack gas velocity ( $V_s$ ):	141.700 feet/second	Total PM front half	37.60 milligrams
Stack gas volumetric flow ( $Q_{std}$ ):	11,712,106 dscf/hour	Total corrected PM <sub>10</sub> back half:	22.44 milligrams
Fractional Moisture content ( $B_{wa}$ ):	0.2240		
Coke Burn Rate ( $R_c$ ):	50,236 lb/hr	Total PM <sub>10</sub> weight ( $M_n$ ):	57.34 milligrams
		Total PM weight ( $M_n$ ):	60.24 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times 0 \times A_n \times (1 - B_{wa})} = 91.4 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = \begin{matrix} 0.0213 \text{ total PM gr/dscf} \\ 0.0010 >PM_{10} \text{ gr/dscf} \\ 0.0123 \text{ filterable PM}_{10} \text{ gr/dscf} \\ 0.0079 \text{ condensible PM}_{10} \text{ gr/dscf} \\ 0.0202 \text{ PM}_{10} \text{ gr/dscf} \end{matrix}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = \begin{matrix} 48.642 \text{ total PM mg/dscm} \\ 2.342 >PM_{10} \text{ mg/dscm} \\ 28.183 \text{ filterable PM}_{10} \text{ mg/dscm} \\ 18.117 \text{ condensible PM}_{10} \text{ mg/dscm} \\ 46.300 \text{ PM}_{10} \text{ mg/dscm} \end{matrix}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = \begin{matrix} 3.037 \times 10^{-5} \text{ total PM lb/dscf} \\ 0.146 \times 10^{-5} >PM_{10} \text{ lb/dscf} \\ 1.760 \times 10^{-5} \text{ filterable PM}_{10} \text{ lb/dscf} \\ 1.131 \times 10^{-5} \text{ condensible PM}_{10} \text{ lb/dscf} \\ 2.891 \times 10^{-5} \text{ PM}_{10} \text{ lb/dscf} \end{matrix}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/Hr):

$$E_p = C_s \times Q_{std} = \begin{matrix} 35.571 \text{ total PM lb/hr} \\ 1.713 >PM_{10} \text{ lb/hr} \\ 20.609 \text{ filterable PM}_{10} \text{ lb/hr} \\ 13.249 \text{ condensible PM}_{10} \text{ lb/hr} \\ 33.858 \text{ PM}_{10} \text{ lb/hr} \end{matrix}$$

$$\text{pmf}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = \begin{matrix} 0.708 \text{ total PM lb}/1000\text{lb coke burn} \\ 0.034 >PM_{10} \text{ lb}/1000\text{lb coke burn} \\ 0.410 \text{ filterable PM}_{10} \text{ lb}/1000\text{lb coke burn} \\ 0.264 \text{ condensible PM}_{10} \text{ lb}/1000 \text{ coke burn} \\ 0.674 \text{ PM}_{10} \text{ lb}/1000 \text{ coke burn} \end{matrix}$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 500  
TEST DATE: 8/8/13  
RUN NUMBER: PM-3

**Data Input:**

V <sub>m</sub> :	46.705	ft <sup>3</sup>	Q <sub>s</sub> :	195.202	dscfm
γ FACTOR:	1		T <sub>s</sub> :	665.2	°F
P <sub>bar</sub> :	29.75	in.Hg	Runtime:	130.59	minutes
ΔH:	0.30	in.H <sub>2</sub> O	V <sub>s</sub> :	141.700	ft/sec
T <sub>m</sub> :	101.1	°F	P <sub>s</sub> :	29.65	in.Hg
V <sub>ic</sub> :	268.2	mL	Noz. diam:	0.148	inches
N:	0.0992		m <sub>ib</sub> :	0.40	mg
V <sub>t</sub> :	0.63	mL	m <sub>ob</sub> :	0.00	mg
m <sub>r</sub> :	22.60	mg			
m <sub>o</sub> :	1.30	mg			

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Volume of sample at standard conditions:**

$$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 43.732 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 1.06 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{ib} + m_{ob} = 0.40 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 21.54 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 22.44 \text{ mg}$$



USEPA Method 201A PM<sub>2.5</sub> Emissions  
D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-3

**Data Input**

Stack temperature (T <sub>s</sub> ):	665.2 °F
Fractional Moisture content (B <sub>ws</sub> ):	0.2240 %
Oxygen (O <sub>2</sub> ):	2.300 %
Stack pressure (P <sub>s</sub> ):	29.65 Inches Hg Abs.
Volume metered (V <sub>mstd</sub> ):	43.732 dscf
Volume of water vapor (V <sub>wstd</sub> ):	12.624 scf
Molecular weight of gas, wet basis (M <sub>s</sub> ):	27.992 lb/lb-mole
Test length (t):	130.59 minutes
D <sub>p</sub> :	10.0 microns

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Stack gas viscosity:**

$$\mu = -150.3162 + (3.4622 \times \sqrt{(T_s + 460)}) + (3.86153 \times 10^{-6} \times (T_s + 460)^2) + (0.591123 \times (\%O_{2, wet})) - (91.9723 \times B_{ws}) + (1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^2)$$

= 289.1 micropoise

**Sample flow rate @ standard conditions:**

$$Q_{sSt} = \frac{V_{mstd}}{t}$$

= 0.335 dscfm

**Sample flow rate through PM<sub>10</sub> cyclone:**

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left( \frac{1}{(1 - B_{ws})} \right) \times \left( \frac{[T_s + 460]}{P_s} \right)$$

= 0.928 cfm

**Calculated Reynolds Number**

$$N_{re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_s}{(T_s + 460)} \right) \times \left( \frac{Q_s}{\mu} \right)$$

= 2046

**Cunningham Correction Factor**

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{[T_s + 460]}{M_s} \right)^{0.50} \right)$$

= 1.035

**D<sub>50</sub> cutpoint (for Cyclone I):**

$$D_{50} = \left( 0.15625 \times \left( \frac{[T_s + 460]}{(M_s \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_s} \right)^{0.7091}$$

= 9.763 μm



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-4

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.3 %
Oxygen (O <sub>2</sub> ):	2.6 %
Nitrogen (N <sub>2</sub> ):	80.1 %
Fractional Moisture Content (B <sub>wo</sub> )	0.2411
Stack Temperature (T <sub>s</sub> ):	667.7 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.6604 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.75 inches Hg
Static Pressure (S <sub>i</sub> )	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.872 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.768 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.654 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 139.536 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 532,615 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 247,161 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 14,829,648 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 187,560 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 11,253,609 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, In  
**Source:** FCCU 500  
**Date:** 8/8/2013  
**Run #:** PM-4

### Data Input:

Volume metered ( $V_m$ ):	46.235 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.75 inches Hg
Meter sample rate ( $\Delta H$ ):	0.36 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	101.5 °F
Volume of moisture collected ( $V_{lc}$ ):	292.1 milliliters
Stack Temperature ( $T_s$ ):	667.7 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 43.268 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 13.749 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2411 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 24.11 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 626.2 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 755.68 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( \frac{A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 24.11 \%$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-4

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.75 inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.65 inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	28.30 milligrams
Test length (t):	128.23 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	11.00 milligrams
Sample nozzle diameter ( $D_n$ ):	0.1480 inches		
Sample nozzle area ( $A_n$ ):	0.000119 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>4</sub> , (Container 4) (Rinse)	3.70 milligrams
Stack temperature ( $T_s$ ):	667.7 °F	Total PM <sub>10</sub> front half:	32.00 milligrams
Volume metered ( $V_{mstd}$ ):	43.268 ft <sup>3</sup>		
Stack gas velocity ( $V_s$ ):	139.536 feet/second	Total PM front half	43.00 milligrams
Stack gas volumetric flow ( $Q_{std}$ ):	11,253,609 dscf/hour	Total corrected PM <sub>10</sub> back half:	15.97 milligrams
Fractional Moisture content ( $B_{wo}$ ):	0.2411		
Coke Burn Rate ( $R_c$ ):	50,439 lb/hr	Total PM <sub>10</sub> weight ( $M_n$ ):	47.97 milligrams
		Total PM weight ( $M_n$ ):	58.97 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wo})}$$

= 95.9 % isokinetic

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}}$$

= 0.0210 total PM gr/dscf

= 0.0039 >PM<sub>10</sub> gr/dscf

= 0.0114 filterable PM<sub>10</sub> gr/dscf

= 0.0057 condensible PM<sub>10</sub> gr/dscf

= 0.0171 PM<sub>10</sub> gr/dscf

$$C_t = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}$$

= 48.132 total PM mg/dscm

= 8.978 >PM<sub>10</sub> mg/dscm

= 26.118 filterable PM<sub>10</sub> mg/dscm

= 13.036 condensible PM<sub>10</sub> mg/dscm

= 39.154 PM<sub>10</sub> mg/dscm

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}}$$

= 3.005 x 10<sup>-6</sup> total PM lb/dscf

= 0.561 x 10<sup>-6</sup> >PM<sub>10</sub> lb/dscf

= 1.631 x 10<sup>-6</sup> filterable PM<sub>10</sub> lb/dscf

= 0.814 x 10<sup>-6</sup> condensible PM<sub>10</sub> lb/dscf

= 2.445 x 10<sup>-6</sup> PM<sub>10</sub> lb/dscf

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= 33.820 total PM lb/hr

= 6.309 >PM<sub>10</sub> lb/hr

= 18.352 filterable PM<sub>10</sub> lb/hr

= 9.160 condensible PM<sub>10</sub> lb/hr

= 27.512 PM<sub>10</sub> lb/hr

$$\text{pmf}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)}$$

= 0.671 total PM lb/1000lb coke burn

= 0.125 >PM<sub>10</sub> lb/1000lb coke burn

= 0.364 filterable PM<sub>10</sub> lb/1000lb coke burn

= 0.182 condensible PM<sub>10</sub> lb/1000 coke burn

= 0.545 PM<sub>10</sub> lb/1000 coke burn

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 500  
TEST DATE: 8/8/13  
RUN NUMBER: PM-4

**Data Input:**

$V_m$ :	46.235	ft <sup>3</sup>	$Q_s$ :	187,560	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	667.7	°F
$P_{bar}$ :	29.75	in.Hg	Runtime:	128.23	minutes
$\Delta H$ :	0.36	in.H <sub>2</sub> O	$V_s$ :	139.536	ft/sec
$T_m$ :	101.5	°F	$P_s$ :	29.65	in.Hg
$V_{ic}$ :	292.1	mL	Noz. diam:	0.148	inches
$N$ :	0.0992		$m_{ib}$ :	0.40	mg
$V_t$ :	0.52	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	15.65	mg			
$m_o$ :	1.60	mg			

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Volume of sample at standard conditions:**

$$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 43.268 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 0.88 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{ib} + m_{ob} = 0.40 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 14.77 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 15.97 \text{ mg}$$



**USEPA Method 201A PM<sub>2.5</sub> Emissions  
D<sub>50</sub> Cutpoint Calculation Summary**

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-4

**Data Input**

Stack temperature (T <sub>s</sub> ):	667.7 °F
Fractional Moisture content (B <sub>wt</sub> ):	0.2411 %
Oxygen (O <sub>2</sub> ):	2.600 %
Stack pressure (P <sub>s</sub> ):	29.65 Inches Hg Abs.
Volume metered (V <sub>mstd</sub> ):	43.268 dscf
Volume of water vapor (V <sub>wstd</sub> ):	13.749 scf
Molecular weight of gas, wet basis (M <sub>g</sub> ):	27.768 lb/lb-mole
Test length (t):	128.23 minutes
D <sub>p</sub> :	10.0 microns

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Stack gas viscosity:**

$$\mu = -150.3162 + \left( 13.4622 \times \sqrt{T_s + 460} \right) + \left( 3.86153 \times 10^{-5} \times (T_s + 460)^2 \right) + \left( 0.591123 \times (\%O_{2,wb}) \right) - (91.9723 \times B_{wt}) + \left( 1.51761 \times 10^{-5} \times B_{wt} \times (T_s + 460)^2 \right)$$

**= 288.4 micropoise**

**Sample flow rate @ standard conditions:**

$$Q_{sstd} = \frac{V_{mstd}}{t} = 0.337 \text{ dscfm}$$

**Sample flow rate through PM<sub>10</sub> cyclone:**

$$Q_{sc} = \frac{29.92}{528} \times Q_{sstd} \times \left( \frac{1}{(1 - B_{wt})} \right) \times \left( \frac{T_s + 460}{P_s} \right)$$

**= 0.958 cfm**

**Calculated Reynolds Number**

$$N_{re} = 6.84 \times 10^5 \times \left( \frac{P_s \times M_g}{(T_s + 460)} \right) \times \left( \frac{Q_{sc}}{\mu} \right)$$

**= 2096**

**Cunningham Correction Factor**

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{T_s + 460}{M_g} \right)^{1.01} \right)$$

**= 1.035**

**D<sub>50</sub> cutpoint (for Cyclone I):**

$$D_{50} = \left( 0.15625 \times \left( \frac{T_s + 460}{(M_g \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_{sc}} \right)^{0.091}$$

**= 9.549 μm**

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{pave} = E_{sbr} \left( \frac{(A+B)S}{AR} \right) + E_{nosb} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$  = average E for daily operating time  
 $E_{sbr}$  = average E of sample(s) containing soot blowing  
 $E_{nosb}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

Run	PM-2	
Date	8/8/2013	
Run time	7:47-11:10	
Soot blow time	10:43 - 10:46	
Soot blow duration	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{sbr}$ ):	35.927 total lb/hr	0.7157 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{nosb}$ ):	18.354 total lb/hr	0.3675 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	2.008 hours	
Average hours of operating per 24 hours, (R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

Filterable PM10 Emissions:	=	18.999 average lb/hr
	=	0.3803 average lb/1000lb coke burn

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

Client: BP  
Location: Whiting, IN  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{\text{pror}} = E_{\text{nbr}} \left( \frac{(A+B)S}{AR} \right) + E_{\text{nosb}} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{\text{pror}}$  = average E for daily operating time  
 $E_{\text{nbr}}$  = average E of sample(s) containing soot blowing  
 $E_{\text{nosb}}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

Run	PM-2	
Date	8/8/2013	
Run time	7:47-11:10	
Soot blow time	10:43 - 10:46	
Soot blow duration	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{\text{nbr}}$ ):	9.519 total lb/hr	0.1896 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{\text{nosb}}$ ):	10.867 total lb/hr	0.2178 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	2.008 hours	
Average hours of operating per 24 hours, (R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

Total Condensible PM Emissions:	=	10.818 average lb/hr
	=	0.2167 average lb/1000lb coke burn

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{pave} = E_{sbr} \left( \frac{(A+B)S}{AR} \right) + E_{nosb} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$  = average E for daily operating time  
 $E_{sbr}$  = average E of sample(s) containing soot blowing  
 $E_{nosb}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

Run	PM-2	
Date	8/8/2013	
Run time	7:47-11:10	
Soot blow time	10:43 - 10:46	
Soot blow duration	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{sbr}$ ):	45.446 total lb/hr	0.9053 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{nosb}$ ):	29.222 total lb/hr	0.5853 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	2.008 hours	
Average hours of operating per 24 hours, ( R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

Total PM10 Emissions:	= 29.817 average lb/hr
	= 0.5970 average lb/1000lb coke burn

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{pror} = E_{abr} \left( \frac{(A+B)S}{AR} \right) + E_{nosb} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$  = average E for daily operating time  
 $E_{abr}$  = average E of sample(s) containing soot blowing  
 $E_{nosb}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

Run	PM-2	
Date	8/8/2013	
Run time	7:47-11:10	
Soot blow time	10:43 - 10:46	
Soot blow duration	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{abr}$ ):	5.022 total lb/hr	0.1000 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{nosb}$ ):	3.759 total lb/hr	0.0752 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	2.008 hours	
Average hours of operating per 24 hours, (R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

Filterable >PM10 Emissions:	= 3.806 average lb/hr
	= 0.0761 average lb/1000lb coke burn

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

Client: BP  
Location: Whiting, In  
Source: FCCU 500  
Date: 8/8/2013  
Run #: PM-2

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{pave} = E_{sbr} \left( \frac{(A+B)S}{AR} \right) + E_{nosb} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$  = average E for daily operating time  
 $E_{sbr}$  = average E of sample(s) containing soot blowing  
 $E_{nosb}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

Run	PM-2	
Date	8/8/2013	
Run time	7:47-11:10	
Soot blow time	10:43 - 10:46	
Soot blow duration	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{sbr}$ ):	50.468 total lb/hr	1.0054 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{nosb}$ ):	32.981 total lb/hr	0.6605 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	2.008 hours	
Average hours of operating per 24 hours, (R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

Total PM + PM>10 Emissions:	= 33.623 average lb/hr
	= 0.6731 average lb/1000lb coke burn



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## **APPENDIX B**

## **Field Data**

---



ms/202

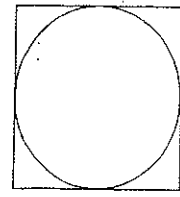
# FIELD DATA

k=6.74

PLANT BP Whiting  
DATE 8-7-13  
LOCATION Whiting, IN  
OPERATOR WAH  
STACK NO. FCU 500  
RUN NO. 1  
SAMPLE BOX NO. APEX  
METER BOX NO. 40827  
START TIME 0935

AMBIENT TEMPERATURE  
BAROMETRIC PRESSURE 29.68  
ASSUMED MOISTURE, % 2.2  
PROBE LENGTH, in. 120  
NOZZLE DIAMETER, in. 1.08  
STACK DIAMETER, in. 0.500149  
MINUTES PER POINT variable  
NUMBER OF PORTS 12

PROBE HEATER SETTING 250  
HEATER BOX SETTING 250  
METER H<sub>2</sub>O 1.58  
C<sub>2</sub> FACTOR 0.84  
Y<sub>2</sub> FACTOR 1.066  
PITOT NO. 354



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (S) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>3</sub> ) °F	VELOCITY HEAD (AP <sub>3</sub> )		DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H <sub>2</sub> O		GAS SAMPLE VOLUME (Nm <sup>3</sup> )	GAS SAMPLE TEMP AT DRY GAS METER (T <sub>dm</sub> ) °F		FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
					(AP <sub>3</sub> )	(ΔP <sub>3</sub> )	ACTUAL	DESIRED		INLET	OUTLET (T <sub>dm, out</sub> ) °F					
9:53	1	0	-1.3	663	2.0		0.36	0.36	176.660	81	82	245	241	83	65	3
9:56	2	9.53		663	2.1		0.36	0.36	180.12	103	94	268	250	84	67	3
10:44	3	19.30		664	2.4		0.36	0.36	183.82	103	95	243	240	83	67	3
10:47	4	29.74		665	2.6		0.36	0.36	187.61	105	96	258	255	84	67	3
11:08	5	40.55		666	2.7		0.36	0.36	191.58	104	96	260	248	85	65	3
11:08	6	51.63		667	2.7		0.36	0.36	195.53	103	95	247	247	85	67	3
9:49	1	62.71		663	2.2		0.36	0.36	199.49	98	94	265	245	85	63	3
10:17	2	72.70		664	2.5		0.36	0.36	203.04	100	94	260	238	83	60	3
10:37	3	83.36		665	2.6		0.36	0.36	206.95	103	97	242	239	83	68	3
11:08	4	94.23		665	2.7		0.36	0.36	210.92	103	97	258	245	83	67	3
10:67	5	105.31		666	2.5		0.36	0.36	215.02	101	96	270	240	85	68	3
9:53	6	115.47		667	2.0		0.36	0.36	218.95	102	96	255	235	85	68	3
11:55		125.50							222.450							
AVERAGE	12	125.50	-1.3	665.0	15522		0.36		45.850		97.4				≤68	max 3

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT	
	#1	#2	#3	#4	#5	g	g
FINAL LIQUID COLLECTED	0	0	100	56		200	
TOTAL LIQUID COLLECTED (specify ml or g)	3138						

ORSAT DATA	TIME		CO <sub>2</sub>		O <sub>2</sub>	
	TRIAL 1	TRIAL 2	TRIAL 3	Average		
				17.5	22	

LEAK CHECK  
SYSTEM PRE: 0.000 CFM@15"Hg  
POST: 0.000 CFM@15"Hg  
PITOT PRE: 4.05 @ > 3"H<sub>2</sub>O  
POST: 4.05 @ > 3"H<sub>2</sub>O



# FIELD SAMPLING TRAIN MOISTURE SUMMARY

Company: BP  
Location: Whiting IN  
Source: FCC 500  
Test Date:  
USEPA Method: 201A/202  
Parameter: PM  
Run PM-1

Net Gain (mL or g)
313.8

Filter 52683

Impinger No	Contents	Final Volume (mL)	Initial Volume (mL)	Net Volume Gain (mL)
1	MT	622.0	353.1	
2	MT	637.5	636.1	
3	~100% DI	603.2	576.7	
4	~200% SG	858.2	841.2	
5				
6				
7				
8				

Silica Gel	Final Weight (g)	Initial Weight (g)	Net Weight Gain (g)

m 5/ m 202/ p m 10

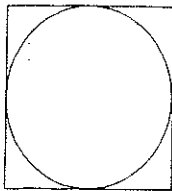
## FIELD DATA

$$k=6.44$$

PLANT	BEWHITING	AMBIENT TEMPERATURE
DATE	8-8-13	BAROMETRIC PRESSURE
LOCATION	WHITING, SW	ASSUMED MOISTURE, %
OPERATOR	W-A-H	PROBE LENGTH, in.
STACK NO.	FCU 500	NOZZLE DIAMETER, in.
RUN NO.	442 PM-2	STACK DIAMETER, in.
SAMPLE BOX NO	APEx	MINUTES PER POINT
METER BOX NO	40827	NUMBER OF POINTS
START TIME	0747	NUMBER OF PORTS

PROBE HEATER SETTING	96
HEATER BOX SETTING	29.725
METER $H_a$	26
$C_2$ FACTOR	120
$Y_4$ FACTOR	8.150 ON 42
PITOT NO.	108
	variable
PRESSURE	12
DIFFERENTIAL	2

WEIGHT OF PARTICULATE, mg	
Filter No.	
Sample	
Final wt	
Tare wt	
Wt. gain	
TOTAL	



PRESSURE  
DIFFERENTIAL

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (8) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>3</sub> ) F	VELOCITY HEAD	
					(AP <sub>1</sub> )	(AP <sub>2</sub> )
0747	1	10	-1.3	658	2.5	—
0757	2	10.18		658	2.5	
0808	3	20.36		659	2.7	
0818	4	30.94		661	2.8	
0829	5	41.71		662	2.8	
0840	6	51.49		663	2.8	
0850	1	62.27		658	2.2	
1019	2	71.82		658	2.3	
1029	3	81.59		659	2.3	
1039	4	91.36		662	2.7	
1049	5	101.94		664	2.8	
1100	6	112.72		665	2.8	
1110		123.50				

GAS SAMPLE		GAS METER	OUTLET (T <sub>out</sub> ) °F	FILTER EXIT TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPIGNER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
TEMPAT	INLET (T <sub>in</sub> ) °F							
86	94		268	235	7084	7067	3	
88	93		265	226	84	67	3	
99	93		233	224	82	60	3	
101	94		259	229	80	61	3	
101	94		234	226	78	60	3	
108	95		233	223	74	59	3	
101	95		270	237	85	68	3	
102	95		245	235	85	67	3	
103	96		253	237	83	66	3	
104	96		247	237	82	65	3	
103	96		245	233	81	63	3	
104	96		248	235	76	59	3	

[illegible]

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL						g
INITIAL	0	0	100	56	—	206
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						
						376

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average		139	34

LEAK CHECK	
SYSTEM PRE: 0.000 CFM@15"Hg	
POST: 0.000 CFM@15"Hg	
PITOT PRE: 4/-065 @ > 3"H <sub>2</sub> O	
POST: 4/-06 @ > 3"H <sub>2</sub> O	



# FIELD SAMPLING TRAIN MOISTURE SUMMARY

Company: BP  
Location: Whiting, IN  
Source: FCU 500  
Test Date: 2/27/2022  
USEPA Method: 201A/202  
Parameter: PM  
Run: PM-2

Net Gain (mL or g)
367.6

262.7  
F/140 52681

Impinger No	Contents	Final Volume (mL)	Initial Volume (mL)	Net Volume Gain (mL)
1	MT	624.4	388.7	
2	MT	580.6	579.4	
3	~100mL DI	725.5	713.1	
4	~200g SG	814.2	803.8	
5				
6				
7				
8				

Silica Gel	Final Weight (g)	Initial Weight (g)	Net Weight Gain (g)



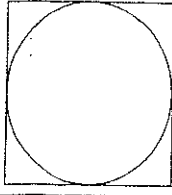
MS/m202/Pm10 FIELD DATA

K=6.44

PLANT BP Whiting  
DATE 8-9-13  
LOCATION Whiting, LA  
OPERATOR Brethleary  
STACK NO. FCU 500  
RUN NO. PM-3  
SAMPLE BOX NO. APEX  
METER BOX NO. 40827  
START TIME 1237

AMBIENT TEMPERATURE 96  
BAROMETRIC PRESSURE 29.75  
ASSUMED MOISTURE, % 26  
PROBE LENGTH, in. 180  
NOZZLE DIAMETER, in. 0.502143  
STACK DIAMETER, in. 108  
MINUTES PER POINT 108  
NUMBER OF PORTS Variable

PROBE HEATER SETTING 250  
HEATER BOX SETTING 250  
METER Hg 1.58  
C<sub>0</sub> FACTOR 0.84  
Y<sub>0</sub> FACTOR 1.000  
PITOT NO. 354



Dwell Time

CLOCK TIME (Hr)	TRAVERSE POINT NUMBER	SAMPLING TIME (S) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>3</sub> ) °F	VELOCITY HEAD (ΔP <sub>3</sub> ) (ΔP <sub>3</sub> )	ACTUAL (ΔP <sub>3</sub> ) (ΔP <sub>3</sub> )	DESIRED (ΔP <sub>3</sub> ) (ΔP <sub>3</sub> )	GAS SAMPLE VOLUME (V <sub>m</sub> ) ft <sup>3</sup>	DIFFERENTIAL ACROSS METER ORIFICE (ΔP <sub>3</sub> ) (ΔP <sub>3</sub> )	ORSAT DATA	SILICA GEL WEIGHT
9:77	1	0	-1.3	663	2.3	2.3	0.30	269.400	0.30	TRIAL 1	
10:18	2	9.77		663	2.5	2.5	0.30	272.66	0.30	TRIAL 2	
10:18	3	19.95		664	2.5	2.5	0.30	276.02	0.30	TRIAL 3	
10:47	4	30.13		665	2.9	2.9	0.30	279.39	0.30	Average	200
11:34	5	41.10		666	3.1	3.1	0.30	283.01	0.30		
11:15	6	52.44		667	3.0	3.0	0.30	286.75	0.30		
10:58	1	63.59		666	2.6	2.6	0.30	290.41	0.30		
10:58	2	73.74		664	2.7	2.7	0.30	294.91	0.30		
10:47	3	84.32		664	2.9	2.9	0.30	298.95	0.30		
11:49	4	95.29		666	3.3	3.3	0.30	303.08	0.30		
11:30	5	106.99		667	3.4	3.4	0.30	307.43	0.30		
11:30	6	118.79		667	3.4	3.4	0.30	311.63	0.30		
11:59		130.59						316.105			
AVERAGE	12	130.59	-1.3	665.2	1.6948	1.6948	0.30	467050	0.30		

GAS SAMPLE TEMP AT DRY GAS METER (T <sub>m</sub> ) °F	INLET (T <sub>m</sub> ) °F	OUTLET (T <sub>m</sub> ) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
104	104	98	850	232	85	68	3
105	105	98	845	238	83	66	3
105	105	98	850	239	77	68	3
105	105	97	865	235	76	68	3
104	104	98	825	230	76	62	3
104	104	99	869	230	76	60	3
105	105	98	862	233	76	62	3
105	105	98	869	235	81	63	3
104	104	97	844	235	81	64	3
104	104	97	864	231	80	65	3
103	103	97	841	230	71	61	3

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average	174	23	

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)	#1	#2	#3	#4	#5
FINAL LIQUID COLLECTED		0	0	100	56	-
TOTAL LIQUID COLLECTED (specify ml or g)	2602					

LEAK CHECK  
SYSTEM PRE 0.000 CFM @ 15" H<sub>2</sub>O  
POST: 0.000 CFM @ 15" H<sub>2</sub>O  
PITOT PRE: +/- OK @ > 3" H<sub>2</sub>O  
POST: +/- OK @ > 3" H<sub>2</sub>O



# FIELD SAMPLING TRAIN MOISTURE SUMMARY

Company: *BP*  
Location: *Whiting IN*  
Source: *FCU 500*  
Test Date: *8-8-13*  
USEPA Method: *201A/202*  
Parameter: *PM*  
*Run 3*

Net Gain (mL or g)
<i>268.2</i>

*Filter 526.76*  
*825.8*

Impinger No	Contents	Final Volume (mL)	Initial Volume (mL)	Net Volume Gain (mL)
1	<i>MT</i>	<i>630.2</i>	<i>390.8</i>	
2	<i>MT</i>	<i>571.2</i>	<i>567.4</i>	
3	<i>~100 mL DF</i>	<i>661.0</i>	<i>650.6</i>	
4	<i>~200g SG</i>	<i>815.9</i>	<i>801.3</i>	
5				
6				
7				
8				

Silica Gel	Final Weight (g)	Initial Weight (g)	Net Weight Gain (g)



MS/M202/PM10

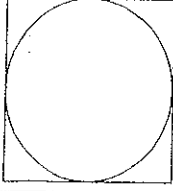
# FIELD DATA

5 = 6.44

PLANT BP Whiting  
DATE 8-8-13  
LOCATION Whiting, LA  
OPERATOR Brett Cleary  
STACK NO. FCU 500  
RUN NO. PM-4  
SAMPLE BOX NO. APEX  
METER BOX NO. 40837  
START TIME 1625

96  
29.73  
86  
180  
0.1500143  
108  
Variable  
1.2  
3

PROBE HEATER SETTING 250  
HEATER BOX SETTING 250  
METER H<sub>2</sub>O 1.58  
C<sub>2</sub> FACTOR 0.57  
NOZZLE DIAMETER, in. 1.000  
PITOT NO. 354



Dwell Time  
10.38  
10.38  
10.52  
10.52  
10.78  
10.78  
11.15  
9.50  
9.55  
10.97  
11.58  
11.34  
11.52  
16.46

CLOCK TIME (Hr)	TRAVERSE POINT NUMBER	SAMPLING TIME (S) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (AP <sub>3</sub> )	VELOCITY (AP <sub>3</sub> )	ACTUAL (AP <sub>3</sub> )	DESIRED	GAS SAMPLE VOLUME (V <sub>m</sub> ) ft <sup>3</sup>	GAS SAMPLE DRY GAS METER INLET (T <sub>in</sub> ) °F	GAS SAMPLE DRY GAS METER OUTLET (T <sub>out</sub> ) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1625	1	0	-1.3	664	2.6	2.6	0.36	0.36	314.375	105	100	260	257	82	67	4
1635	2	10.38		664	2.6	2.6	0.36	0.36	320.02	106	99	273	249	84	66	4
1645	3	20.76		665	2.7	2.7	0.36	0.36	323.78	106	99	273	243	83	65	4
1656	4	31.34		667	2.7	2.7	0.36	0.36	327.42	105	98	259	242	82	65	4
1707	5	41.86		668	2.6	2.6	0.36	0.36	331.22	105	98	230	236	78	61	4
1717/1728	6	52.64		669	3.0	3.0	0.36	0.36	335.17	105	98	241	238	77	64	4
1740	1	63.79		668	2.2	2.2	0.36	0.36	339.22	104	98	233	233	84	66	4
1749	2	73.34		666	2.2	2.2	0.36	0.36	343.01	105	98	260	233	82	65	4
1759	3	82.84		668	2.2	2.2	0.36	0.36	346.42	105	98	235	231	82	65	4
1810	4	93.86		670	3.2	3.2	0.36	0.36	350.48	105	97	261	236	82	61	4
1822	5	105.38		671	3.1	3.1	0.36	0.36	354.51	104	97	246	231	78	54	4
1833	6	116.71		672	3.2	3.2	0.36	0.36	358.52	104	97	257	235	74	53	4
1846		128.23							362.610							
AVERAGE	12	128.23	-1.3	667.67	1.6604		0.36		462.35	101.50						

VOLUME OR WEIGHT OF LIQUID COLLECTED	#1	#2	#3	#4	#5	SILICA GEL WEIGHT
FINAL	0	0	100	56	-	200
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						243.5

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average		17.3	2.5

LEAK CHECK  
SYSTEM PRE: 0.000 CFM@15"Hg  
POST: 0.000 CFM@15"Hg  
PITOT PRE: 41-05 @ > 3"H<sub>2</sub>O  
POST: 71-05 @ > 3"H<sub>2</sub>O



# FIELD SAMPLING TRAIN MOISTURE SUMMARY

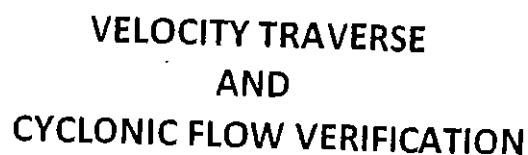
Company: *BP*  
Location: *Whiting, IN*  
Source: *FCU 500*  
Test Date: *8-8-13*  
USEPA Method: *2014-202*

Net Gain (mL or g)

Parameter: *Run PM-4*  
*Filter: 92682*

Impinger No	Contents	Final Volume (mL)	Initial Volume (mL)	Net Volume Gain (mL)
1	<i>MT</i>	<i>628.7</i>	<i>359.0</i>	
2	<i>MT</i>	<i>617.5</i>	<i>615.8</i>	
3	<i>~100ml DI</i>	<i>719.5</i>	<i>709.6</i>	
4	<i>~200 g SG</i>	<i>817.0</i>	<i>806.2</i>	
5				
6				
7				
8				

Silica Gel	Final Weight (g)	Initial Weight (g)	Net Weight Gain (g)



### SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. \_\_\_\_\_  
 STATIC, in. H<sub>2</sub>O \_\_\_\_\_  
 START: \_\_\_\_\_ STOP: \_\_\_\_\_  
 PRE-TEST: \_\_\_\_\_ POST-TEST: \_\_\_\_\_

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			



TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting  
Date 8-7-13  
Sampling Location Rev 500  
Inside of Far Wall to  
Outside of Port (Distance C) 114.5 in.  
Inside of Near Wall to  
Outside of Port (Distance D) 6.5 in.  
Stack ID (Distance C-Distance D) 108  
Port Distance Downstream From Disturbance (B) 1368 in.  
Port Distance Upstream From Disturbance (A) 720 in.  
Equivalent Diameters Downstream From Disturbance (B) 12.67 ( $\geq 2.0$ )  
Equivalent Diameters Upstream From Disturbance (A) 6.67 ( $\geq 0.5$ )  
Number of Ports Used 2 Traverse Points / Port 6

Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = 12.67  
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = 6.67  
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =  
[(2 x L x W) / (L + W)]

Port ID 6 in. (for monorail bracket specs.)  
Port Length Outside of Stack 4 in. (for monorail bracket specs.)

1 2 3 4 5 6

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	108	4.75	6.5	11.25
2	0.146		15.27		22.27
3	0.296		31.97		38.47
4	0.704		76.03		82.53
5	0.854		92.23		98.73
6	0.956		103.25		109.75
7					
8					
9					
10					
11					
12					

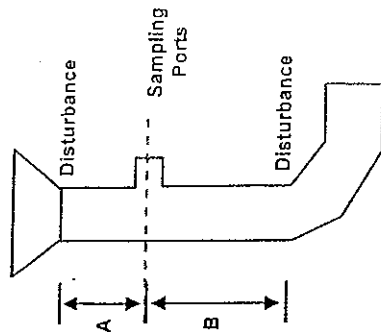
For Stacks / Ducts  $\leq 24$  inches ID - No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts  $> 24$  inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check: Completeness \_\_\_\_\_ Legibility \_\_\_\_\_ Accuracy \_\_\_\_\_ Specifications \_\_\_\_\_

Method 1 Calculator Signature/Date WAH mdy/mdd/yy 8-7-13

Field Supervisor Signature/Date \_\_\_\_\_



LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

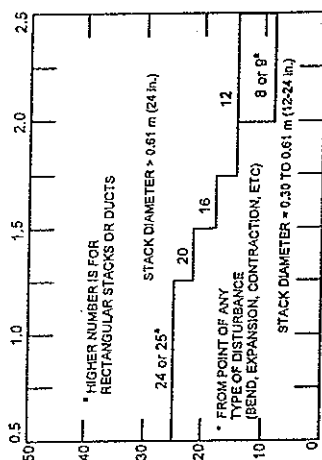
PTS	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.2	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	71.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

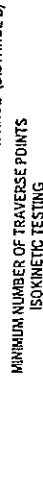
PTS	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3	83.3	62.5	50.0	41.7	35.7	31.3	27.8	
4		87.5	70.0	58.3	50.0	43.8	38.9	
5			90.0	75.0	64.3	56.3	50.0	
6				91.7	78.6	68.8	61.1	
7					92.9	81.3	72.2	
8						93.8	83.3	
9							94.4	

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

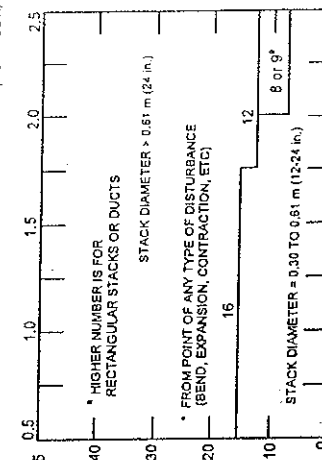
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



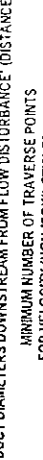
DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)



DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)





## SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 8-7-13

Nozzle Clean: (Y) / N

Nozzle ID: SS 201A / SS 0.218

Nozzle Undamaged: (Y) / N

Nozzle Type: PM<sub>10</sub> / SS

Absent of Nicks or Dents: (Y) / N

Inspected By: RB

Leading Edge Sharp: (Y) / N

Nozzle Diameter				
D <sub>1</sub> (inches)	D <sub>2</sub> (inches)	D <sub>3</sub> (inches)	ΔD (inches)	D <sub>avg</sub> (inches)
0.148	0.147	0.148	0.001	0.148
0.218	0.218	0.218	0.000	0.218

where:

D<sub>1, 2, 3</sub> = three different nozzle diameter measurements, (inches); each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches); ΔD ≤ 0.004 inches

D<sub>avg</sub> = average of D<sub>1</sub>, D<sub>2</sub>, and D<sub>3</sub>, (inches)



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## **APPENDIX C**

## **Analytical Data**

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# ***ANALYTICAL REPORT***

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 8/7 - 8/8/13

Lab Project Number: 08-561

COC Numbers(s): W01451 – W01453

Analysis Date(s): 8/12 - 8/19/13

Analytical Method(s): USEPA Method 201A, USEPA Method 202

***Prepared For:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Project Mgr: Steve Flaherty  
Phone: 847-487-1580 x117  
Fax: 847-487-1587  
E-mail: sflaherty@arienv.com

***Prepared By:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Eric Vogt, Lab Manager  
Phone: 847-487-1580 ext.116  
Fax: 847-487-1587  
E-mail: evogt@arienv.com

- This analytical report has been made for your exclusive and confidential use.
- The results and interpretations expressed in this report represent the best judgment of ARI Environmental, Inc.
- This report shall not be reproduced, except in full, without the expressed written approval of ARI Environmental, Inc.

State of Texas TCEQ/NELAP Certificate ID: T104704428-12-4  
State of Louisiana LDEQ/LELAP Certificate ID: 02010  
State of New Jersey NJDEP Certification ID: IL007



## Project Narrative

---

### ***Sample Receipt and Acceptance Quality Assurance:***

Thirty-one (31) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 8/12/13. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

### ***Analytical Quality Assurance:***

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

### ***Data Interpretation and Comments:***

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

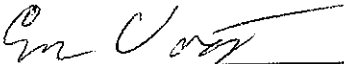
### ***Scope of Accreditation:***

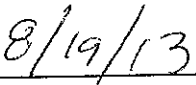
All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

### ***Laboratory Contact Information:***

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at [evogt@arienv.com](mailto:evogt@arienv.com).

Reviewed and Approved by:

  
\_\_\_\_\_  
Signature: Laboratory Manager

  
\_\_\_\_\_  
Date



# ANALYTICAL SUMMARY

CLIENT: BP Whiting  
LOCATION: Whiting, IN  
SOURCE: FCCU 500  
SAMPLE DATE: 8/7/13 - 8/8/13  
ANALYSIS: Particulates  
METHOD: USEPA Methods 201A/202

page 1 of 2  
ANALYST: J. Ruggaber  
DATE OF COMPLETION: 8/19/2013  
TEMPLATE CONTROL ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3  
PROJECT NUMBER: 08-561

Identification	LIMS Number	Solvent Mass (g)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Particulate (mg)	Blank Corrected Particulate (mg)
PM-1 Filter	11168	-	824.2	850.8	851.1	-0.30	N/A	26.75	-
PM-1 PW	11170	166.8	119676.1	119679.6	119679.9	-0.30	N/A	3.65	N/A
PM-1, >PM10	11169	40.1	116890.4	116896.4	116896.7	-0.30	N/A	6.15	N/A
PM-2 Filter	11174	-	820.0	866.4	866.4	0.00	N/A	46.40	-
PM-2 PW	11176	139.1	109179.3	109190.7	109191.0	-0.30	N/A	11.55	N/A
PM-2, >PM10	11175	33.7	105776.3	105784.4	105784.4	0.00	N/A	8.10	N/A
PM-3 Filter	11180	-	825.8	855.9	856.1	-0.20	N/A	30.20	-
PM-3 PW	11183	135.3	119877.3	119881.8	119882.2	-0.40	N/A	4.70	N/A
PM-3, >PM10	11181	46.5	113239.9	113242.9	113242.7	0.20	N/A	2.90	N/A
PM-4 Filter	11187	-	821.4	849.7	849.7	0.00	N/A	28.30	-
PM-4 PW	11189	162.7	116624.0	116627.5	116627.9	-0.40	N/A	3.70	N/A
PM-4, >PM10	11188	41.1	105886.2	105897.3	105897.1	0.20	N/A	11.00	N/A
Acetone Blank	11193	148.8	118198.8	118198.6	118198.9	-0.30	N/A	<0.10	-

Identification	Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	Accuracy	Pass/Fail
LCS	100	123841.9	123940.9	123941.4	-0.50	99.25	100.51	98.7	Pass

CLIENT: BP Whiting  
LOCATION: Whiting, IN  
SOURCE: FCCU 500  
SAMPLE DATE: 8/7/13 - 8/8/13  
ANALYSIS: Particulates  
METHOD: USEPA Methods 201A/202

page 2 of 2

ANALYST: J. Ruggaber  
DATE OF COMPLETION: 8/19/2013  
TEMPLATE CONTROL ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3  
PROJECT NUMBER: 08-561

#### M202 Organic Rinse

Identification	LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Condensate (mg)
PM-1	11172	114655.9	114656.4	114656.8	-0.40	N/A	0.70
PM-2	11178	112633.0	112633.0	112633.4	-0.40	N/A	0.20
PM-3	11185	102512.7	102513.9	102514.1	-0.20	N/A	1.30
PM-4	11191	114857.1	114858.5	114858.9	-0.40	N/A	1.60
Field Blank	11198	116793.1	116793.0	116793.2	-0.20	N/A	<0.10
Acetone Blank	11195	101428.4	101428.2	101428.3	-0.10	N/A	<0.10
Hexane Blank	11196	114543.6	114543.4	114543.5	-0.10	N/A	<0.10

#### M202 Imp Contents

Identification	LIMS Number	mL of NH <sub>4</sub> OH added	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Condensate (mg)*
PM-1	11171	0.89	103518.5	103538.7	103539.2	-0.50	N/A	20.45
PM-2	11177	0.56	100852.0	100868.4	100868.6	-0.20	N/A	16.50
PM-3	11184	0.63	113979.6	114002.2	114002.2	0.00	N/A	22.60
PM-4	11190	0.52	98541.2	98556.6	98557.1	-0.50	N/A	15.65
Field Blank	11197	0.05	115838.8	115839.0	115839.4	-0.40	N/A	0.40
DI Water Blank	11194	-	120430.8	120430.7	120430.8	-0.10	N/A	<0.10

Ammonium Hydroxide Conc = 0.0992 N

\*Not Corrected for Ammonium Hydroxide titration



951 Old Rand Road # 106

Wauconda, IL 60084



Texas NELAP ID: T 104704426-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID: M5 Filter Run PM-1  
Lab Sample #: 11168

Date Sampled: 08/07/2013

Field #: 52683

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	26.75	mg	

Sample ID: GT PM10 Catch Run PM-1  
Lab Sample #: 11169

Date Sampled: 08/07/2013

Field #: 52500

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	6.15	mg	

Sample ID: Front Half Probe Wash Run PM-1  
Lab Sample #: 11170

Date Sampled: 08/07/2013

Field #: 52501

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	3.65	mg	

Sample ID: Imp Contents Run PM-1  
Lab Sample #: 11171

Date Sampled: 08/07/2013

Field #: 52502

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	20.45	mg	

Sample ID: Organic Rinse Run PM-1  
Lab Sample #: 11172

Date Sampled: 08/07/2013

Field #: 52503

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	0.70	mg	



951 Old Rand Road # 106

Wauconda, IL 60084



## ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID: CPM Filter Run PM-1  
Lab Sample #: 11173

Date Sampled: 08/07/2013

Field #: 52504

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Sample ID: M5 Filter Run PM-2  
Lab Sample #: 11174

Date Sampled: 08/08/2013

Field #: 52681

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Particulate	Method 201A	Joel Ruggaber	08/19/2013	46.40	mg	
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Sample ID: GT PM10 Catch Run PM-2  
Lab Sample #: 11175

Date Sampled: 08/08/2013

Field #: 52505

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Particulate	Method 201A	Joel Ruggaber	08/19/2013	8.10	mg	
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Sample ID: Front Half Probe Wash Run PM-2  
Lab Sample #: 11176

Date Sampled: 08/08/2013

Field #: 52506

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Particulate	Method 201A	Joel Ruggaber	08/19/2013	11.55	mg	
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Sample ID: Imp Contents Run PM-2  
Lab Sample #: 11177

Date Sampled: 08/08/2013

Field #: 52507

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	16.50	mg	
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951 Old Rand Road # 106

Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID:	Organic Rinse Run PM-2			Date Sampled:	08/08/2013	
Lab Sample #:	11178			Field #:	52508	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	0.20	mg	

Sample ID:	CPM Filter Run PM-2			Date Sampled:	08/08/2013	
Lab Sample #:	11179			Field #:	52509	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID:	M5 Filter Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11180			Field #:	52676	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	30.20	mg	

Sample ID:	GT PM10 Catch Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11181			Field #:	52510	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	2.90	mg	

Sample ID:	Front Half Probe Wash Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11183			Field #:	52511	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	4.70	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID:	Imp Contents Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11184			Field #:	52512	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	22.60	mg	

Sample ID:	Organic Rinse Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11185			Field #:	52513	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	1.30	mg	

Sample ID:	CPM Filter Run PM-3			Date Sampled:	08/08/2013	
Lab Sample #:	11186			Field #:	52514	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID:	M5 Filter Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11187			Field #:	52682	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	28.30	mg	

Sample ID:	GT PM10 Catch Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11188			Field #:	52515	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	11.00	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID:	Front Half Probe Wash Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11189			Field #:	52516	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	3.70	mg	

Sample ID:	Imp Contents Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11190			Field #:	52517	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	15.65	mg	

Sample ID:	Organic Rinse Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11191			Field #:	52518	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	1.60	mg	

Sample ID:	CPM Filter Run PM-4			Date Sampled:	08/08/2013	
Lab Sample #:	11192			Field #:	52519	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID:	Front Half Acetone Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11193			Field #:	52520	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	08/19/2013	<0.10	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID:	DI Water Reagent Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11194			Field #:	52521	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	<0.10	mg	

Sample ID:	Acetone Reagent Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11195			Field #:	52522	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	<0.10	mg	

Sample ID:	Hexane Reagent Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11196			Field #:	52523	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	<0.10	mg	

Sample ID:	Imp Contents Field Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11197			Field #:	52524	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	0.40	mg	

Sample ID:	Organic Rinses Field Blank			Date Sampled:	08/07/2013	
Lab Sample #:	11198			Field #:	52525	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	08/19/2013	<0.10	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-561  
Project Manager: Steve Flaherty  
Received: 8/12/2013  
Reported: 8/19/2013

Sample ID: CPM Filter Field Blank  
Lab Sample #: 11199

Date Sampled: 08/07/2013

Field #: 52526

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Notes: UA - Not a NELAC accredited analyte under this method.  
NA - Sample not tested for this analyte.  
D - Value calculated from dilution.  
J - Value less than the low standard but above the Limit of Detection (LOD).  
L - Sample leaked before receipt.  
H - Value greater than the high standard.



## USEPA METHOD 201A TASK SCHEDULE

Client: BP

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 8/7/13 – 8/8/13

Lab Project #: 08-561

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

DATE	TIME	EQUIPMENT	TASK
8/12/13	10:29	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs)
8/14/13	10:15	Oven #2	Heat filters in oven at 105 °C (approximately 2 hours)
8/14/13	12:25	Desiccator #1	Place filters in desiccator (store min. 24 hours)
8/13/13	10:59	Balance #1	Weigh conditioned beakers and record tares
8/13/13 – 8/14/13	-	-	Dry down probe washes and/or cyclone separator fractions and blanks in tared beakers in the hood.
8/13/13 – 8/14/13	-	Oven #2	In a tared beaker, dry down 100 mL of the LCS solution in an oven at 110 °C.
8/14/13	9:00	Desiccator #1	Place beakers in dessicator (store min. 24 hours)
8/16/13	9:31	Balance #1	Beaker weighing #1
8/16/13	15:32	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
8/19/13	9:08	Balance #1	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
8/16/13	9:28	Balance #1	Filter weighing #1 (min. 24 hrs in dessicator)
8/16/13	15:29	Balance #1	Filter weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Filter weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Filter weighing #4 (min. 6 hrs after weighing #3)
8/19/13	-	-	Prepare report
			Report QA review
			Report distribution

LCS Sodium Chloride Solution: 1.0051 g/L NaCl, WL-Log#4-Log-037A:173

**USEPA METHOD 202 TASK SCHEDULE FORM**

Document Number: WL-202TASK-FORM-025B

Revision Number: 2

Effective Date: 01/20/11

**USEPA METHOD 202 TASK SCHEDULE**

Client: BP

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 8/7/13 – 8/8/13

Lab Project #: 08-561

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

**Reagent Information**

Hexane Lot #13040459, Tedia Solvents

Phenolphthalein Solution (if needed): WL-Log#4-Log-037A:46

0.1 N Ammonium Hydroxide Lot # (if needed): 0.0992 N, Lot SHBC0698V, Fluka

Sodium Chloride Solution: 1.0051 g/L NaCl, WL-Log#4-Log-037A:173

DATE	TIME	EQUIPMENT	TASK
8/12/13	10:29	Desiccator # 2	Label beakers for hexane rinse, imp samples, and LCS sample. Place beakers in desiccator (store 24 hrs).
8/13/13	10:59	Balance #1	Weigh conditioned beakers and record tares.
8/13/13	-	-	Sonicate filter in water for at least two minutes. Add the water to the imp contents. Repeat 2 more times.
8/13/13	-	-	Sonicate filter in hexane for at least two minutes. Add the hexane to the hexane sample contents. Repeat 2 more times.
8/13/13	-	-	Extract the imp contents with 30 mL of hexane 3 times. Collect all hexane extractions in the labeled and tared hexane beaker. Add the hexane sample to the hexane extractions.
8/13/13	-	-	Drain the water phase into the labeled and tared beaker.
8/13/13 - 8/14/13	-	-	Evaporate hexane beakers to dryness in a fume hood.
8/13/13	-	-	Transfer 100 mL of the sodium chloride solution into the tared LCS beaker.



# USEPA METHOD 202 TASK SCHEDULE FORM

Document Number: WL-202TASK-FORM-025B

Revision Number: 2

Effective Date: 01/20/11

8/13/13 - 8/14/13	-	Oven #1	Place the water phase beakers and LCS sample in an oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
8/14/13	10:39	Desiccator #2	Place hexane beakers in desiccator (store min. 24 hours)
		See next section	Place aqueous beakers in desiccator (store min. 24 hours)
8/16/13	9:40	Balance #1	Hexane beaker weighing #1
8/16/13	15:42	Balance #1	Hexane beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Hexane beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Hexane beaker weighing #4 (min. 6 hrs after weighing #3)
		See next section	Water Phase and LCS beaker weighing #1
N/A	N/A	N/A	Water Phase and LCS beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #4 (min. 6 hrs after weighing #3)
<b>If Water Phase Beakers achieve constant weight, skip this section</b>			
8/14/13	-	-	Redissolve the residue from water phases in 100 mL of DI water. Add approximately 5 drops of phenolphthalein.
8/14/13	-	-	Titrate with 0.1 N ammonium hydroxide. Record the amount of ammonium hydroxide used.
8/14/13	-	-	Return the water phase beakers to the oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
8/15/13	8:45	Desiccator #2	Place beakers in desiccator (store min. 24 hours)
8/16/13	9:41	Balance #1	Water Phase beaker weighing #1
8/16/13	15:43	Balance #1	Water Phase beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase beaker weighing #4 (min. 6 hrs after weighing #3)
<b>End Section</b>			
8/19/13	-	-	Prepare report
			Report QA review
			Report distribution



951 Old Rand Road, Unit 106  
Wauconda, Illinois 60084



1710 Preston Road, Unit C  
Pasadena, Texas 77503

## SAMPLE RECEIPT CHECKLIST

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 8/7 - 8/8/13

Chain-of-Custody Number(s): W01451 - W01453

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Preservation code noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Project information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Sample information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Analysis request clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Report tier level noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Sample Containers:

Quantity of samples match number on COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Container label ID numbers and descriptions match COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All containers received in good condition	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Liquid levels at marked heights on containers	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All container labels are legible	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All sample IDs are unique	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received in correct type of container	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received within the required holding time	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received under the required preservation code	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met.

Samples Received by: Eric Vogt Eric Vogt  
Printed Name Signature

Date and Time Received: 8/12/13 9:00 a.m.



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01451

Lab Project No. (Lab use only) 08-561	Client Name BP	Client Location Whiting, IN	Number of Containers		Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request <sup>1</sup>		Preservation Code
ARI Proposal Number	ARI Test Plan Number	ARI Project Manager S. Flaherty							1 = Ambient Temp. 2 = 4°C (Ice Packs) 3 = Dry Ice 4 = Other (Noted)
ARI Sampler Initials RB AHM, BO	Laboratory (Wauconda or Pasadena) Wauconda	Subcontracted Laboratory (if applicable)							
Engineering or Compliance Test Samples									
Label Number	Sample Date	Time of Collection <sup>2</sup>	Sample Identification						
52687	8-7-13		MS Filter PM-1						
52681	8-8-13		" PM-2						
52676			" PM-3						
52682			" PM-4						
			<del>Front to back PM</del>						
52500	8-7-13		> PM Catch PM-1						
52501			Front to back PM-1						
52502			Imp Contents PM-1						
52503			Organic Rinses PM-1						
52504			CPM Filter PM-1						
52505	8-8-13		> PM Catch PM-2						
52506			Front to back PM-2						
52507			Imp contents PM-2						
52508			Organic Rinses PM-2						
52509			CPM Filter PM-2						
Special Instructions:			(1) Relinquished By		(2) Relinquished By		(3) Relinquished By		SHIPMENT:
			(1) Date / Time 8-9-13 1:30		(2) Date / Time		(3) Date / Time		Hand Carry
			(1) Company ARI		(2) Company		(3) Company		FedEx
Date test results needed: Noval Twin			(1) Received By Noval Twin		(2) Received By		(3) Received By		UPS
Reporting level: Engineering			(1) Date / Time 8/12/13 9:00		(2) Date / Time		(3) Date / Time		Custody Seal Applied
Route results through: S. Flaherty			(1) Company ARI		(2) Company		(3) Company		Yes No
Project manager signature:									



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01452

Lab Project No. (Lab use only) 08-561	Client Name BTP	Client Location Whiting, TX	ARI Project Manager S. Flaherty	Subcontracted Laboratory (if applicable)
ARI Proposal Number	ARI Test Plan Number	Laboratory (Wauconda or Pasadena)	Wauconda	
ARI Sampler Initials RB/ML/TM/BB	Engineering or Compliance Test Samples Compliance			
Label Number	Sample Date	Time of Collection <sup>2</sup>	Sample Identification	Number of Containers
52510	8-8-13		> PM10 Catch	PM-13
52511			Front 1/2 PW	PM-13
52512			Imp contents	PM-13
52513			organic rinses	PM-13
52514			CPM Filter	PM-13
52515			> PM10 Catch	PM-14
52516			Front 1/2 PW	PM-14
52517			Imp contents	PM-14
52518			organic rinses	PM-14
52519			CPM Filter	PM-14
52520	8-7-13		Front 1/2 Acetone	Blank
52521			DL H <sub>2</sub> O	Blank
52522			Acetone	Blank
52523			Hexane	Blank
<b>Special Instructions:</b>				
(1) Relinquished By [Signature] (2) Relinquished By [Signature]				
(1) Date / Time 8-9-13 1930 (2) Date / Time				
(1) Company ART (2) Company				
(1) Received By [Signature] (2) Received By				
(1) Date / Time 8/12/13 9:00 (2) Date / Time				
(1) Company ART (2) Company				
Date test results needed: Normal Turn				
Reporting level: Engineering				
Route results through: S. Flaherty				
Project manager signature: [Signature]				
SHIPMENT: Hand Carry, FedEx, UPS, Custody Seal Applied, Yes No				



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01453

Lab Project No. (Lab use only) 08-561	Client Name BP	Client Location Wh. T. 9, IN	ARI Project Manager S. Flaherty	Subcontracted Laboratory (if applicable)
ARI Proposal Number	ARI Test Plan Number	Laboratory (Wauconda or Pasadena) Wauconda	Engineering or Compliance Test Samples Compliance	
ARI Sampler Initials RAAH, TM, BO	Sample Date 8-7-13	Time of Collection <sup>2</sup>	Sample Identification	Number of Containers
52524	8-7-13		Top Contents Field Blk	1 Bottle
52525			Organic Resins Field Blk	1
52526			CPM Filter Field Blk	1
52527	8-7-13		Front 1/2 DI H <sub>2</sub> O Field Blk	1
52680			5F Filter Blank	1 Petri
52695			5F Filter SF-1	1
52684			5F Filter SF-2	1
52685			5F Filter SF-3	1
52529			Front 1/2 PW SF-1	1 Bottle
52530			Front 1/2 PW SF-2	1
52531			Front 1/2 PW SF-3	1
Special Instructions:				
(1) Relinquished By				
(1) Date / Time 8-9-13 1930				
(1) Company ARI				
(2) Relinquished By				
(2) Date / Time				
(2) Company				
Date test results needed:				
Normal Turn				
Reporting level: Engineering				
Route results through: S. Flaherty				
Project manager signature: Compliance				
SHIPMENT:				
Hand Carry				
FedEx				
UPS				
Custody				
Seal				
Applied				
Yes No				



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## **APPENDIX D**

## **Calibration Data**

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**APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION  
USING CALIBRATED CRITICAL ORIFICES  
5-POINT ENGLISH UNITS**

Meter Console Information	
Console Model Number	MC522
Console Serial Number	40827
DGM Model Number	MS4
DGM Serial Number	DGM 504004

Calibration Conditions	
Date	4-Dec-12
Barometric Pressure	29.4 in Hg
Theoretical Critical Vacuum <sup>1</sup>	13.9 in Hg
Calibration Technician	B. Crane

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient, K', must be entered in English units, (ft<sup>3</sup>•in.<sup>2</sup>)/(in.Hg•min).

Calibration Data									
Metering Console					Critical Orifice				
Run Time	DGM Orifice	Volume	Volume	Outlet Temp	Serial Number	Coefficient	Amb Temp	Amb Temp	Actual Vacuum
Elapsed (e)	(P <sub>in</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	Initial (t <sub>in</sub> )		K'	Final (t <sub>out</sub> )	(t <sub>out</sub> )	
min	in H <sub>2</sub> O	cubic feet	cubic feet	°F		see above <sup>2</sup>	°F	°F	in Hg
10.0	2.9	897.600	907.790	74	OX73	0.7780	75	76	16
11.0	1.7	880.300	888.760	71	OX63	0.5905	72	73	18
10.0	0.9	912.500	918.330	76	OX55	0.4455	75	74	20
13.0	0.6	923.100	928.980	77	OX48	0.3451	75	74	22
19.0	0.2	932.800	938.520	76	OX40	0.2303	75	75	23

Results									
Standardized Data					Dry Gas Meter				
Dry Gas Meter	Critical Orifice	Calibration Factor	Value	Variation	Flowrate	Std & Corr	7.6 SCFM	Variation	ΔH @
(V <sub>avg</sub> )	(V <sub>Crit</sub> )	(Y)	(Y)	(ΔY)	(Q <sub>avg</sub> )	(Q <sub>avg</sub> corr)	(ΔH @)	(ΔH @)	
cubic feet	cubic feet				cfm	cfm	in H <sub>2</sub> O		
9.943	9.874	0.993	0.993	-0.007	0.987	0.987	1.646	0.065	
8.277	8.267	0.999	0.999	-0.002	0.752	0.752	1.665	-0.084	
5.645	5.659	1.003	1.003	0.002	0.566	0.566	1.589	-0.011	
5.683	5.699	1.003	1.003	0.002	0.438	0.438	1.559	-0.022	
5.829	5.556	1.005	1.005	0.004	0.292	0.292	1.464	-0.116	
		1.000	1.000	Y Average			1.581	ΔH @ Average	

CAL-MASTERMETER-WORKBOOK-2037-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +0.02

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 12-4-12

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Pre -Test



Meter Box: 40827

Calibrator: B. Crane

Date: 12/4/2012

Barometric: 29.37

Ambient Temp: 71

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	1	0.22	0	0.00	1	0.22
100	100	0.00	99	-0.18	100	0.00
200	202	0.30	201	0.15	202	0.30
300	302	0.26	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	500	0.00	499	-0.10	500	0.00

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	1	0.22	0	0.00	1	0.22
100	100	0.00	99	-0.18	100	0.00
200	202	0.30	202	0.30	202	0.30
300	302	0.26	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	500	0.00	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	1	0.22
200	202	0.30
400	398	-0.23
600	601	0.09
800	803	0.24
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1400	0.00
1600	1603	0.15
1800	1801	0.04

Revised 10/03

# APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION

## USING CALIBRATED CRITICAL ORIFICES

### 3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	40827
DGM Model Number	MS-4
DGM Serial Number	504004.00

Calibration Conditions	
Date	12-Aug-13
Time	2:30
Barometric Pressure	29.2 in Hg
Theoretical Critical Vacuum <sup>1</sup>	13.8 in Hg
Calibration Technician	S. Crane

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647 or/in Hg

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient, K', must be entered in English units, (ft<sup>3</sup>\*°R<sup>1/2</sup>)/(in.Hg\*min).

Metering Console				Calibration Data				Critical Orifice			
Run Time	Elapsed (s)	DGM Orifice ΔH (°R)	Volume Initial (V <sub>ini</sub> ) cubic feet	Volume Final (V <sub>fin</sub> ) cubic feet	Outlet Temp Initial (t <sub>ini</sub> ) °F	Outlet Temp Final (t <sub>fin</sub> ) °F	Serial Number	Coefficient	Amb Temp Initial (t <sub>amb</sub> ) °F	Amb Temp Final (t <sub>amb</sub> ) °F	Actual Vacuum in Hg
10.0	10.0	1.7	535.600	543.340	81	78	OX63	0.5894	77	76	18
10.0	10.0	1.7	543.340	551.080	78	78	OX63	0.5894	76	77	18
10.0	10.0	1.7	551.080	558.840	78	79	OX63	0.5894	77	76	18

Standardized Data				Dry Gas Meter			
Dry Gas Meter (V <sub>meas</sub> ) cubic feet	Critical Orifice (Q <sub>meas</sub> ) cfm	Value (V)	Variation (ΔV)	Calibration Factor		Flowrate	
				Std & Corr (Q <sub>standard</sub> ) cfm	ΔH @	0.75 SCFM (ΔH @) in H <sub>2</sub> O	Variation (ΔΔH @)
7.424	0.742	1.001	0.002	0.743	-0.003	1.670	
7.445	0.745	0.998	0.000	0.743	0.002	1.674	
7.457	0.746	0.996	-0.002	0.743	0.001	1.673	
Pretest Gamma	1.000	% Deviation	0.2	Y Average	ΔH @ Average	1.672	

JCAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature

Date

8-12-13

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Post-Test



Meter Box: 40827  
 Calibrator: B. Crane  
 Date: 8/12/2013  
 Barometric: 29.2  
 Ambient Temp: 78

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	3	0.65	3	0.65	3	0.65
100	100	0.00	100	0.00	100	0.00
200	204	0.61	204	0.61	204	0.61
300	302	0.26	302	0.26	302	0.26
400	400	0.00	400	0.00	400	0.00
500	500	0.00	500	0.00	500	0.00

Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	3	0.65	3	0.65	3	0.65
100	100	0.00	101	0.18	101	0.18
200	204	0.61	204	0.61	204	0.61
300	303	0.39	303	0.39	303	0.39
400	400	0.00	401	0.12	401	0.12
500	500	0.00	500	0.00	500	0.00

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	3	0.65
200	204	0.61
400	400	0.00
600	603	0.28
800	805	0.40
1000	1004	0.27

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1202	0.12
1400	1400	0.00
1600	1603	0.15
1800	1801	0.04

# Pitot Tube Inspection Data

Client Name: \_\_\_\_\_

Date: \_\_\_\_\_

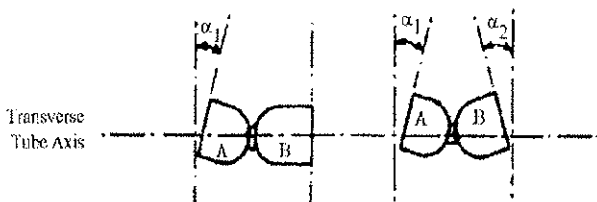
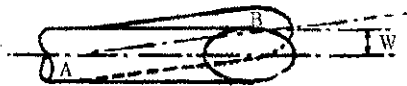
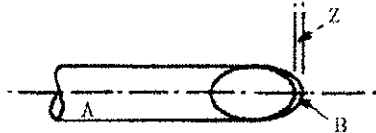
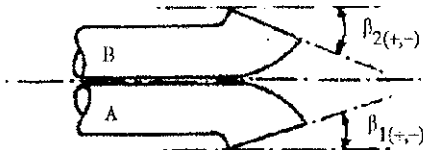
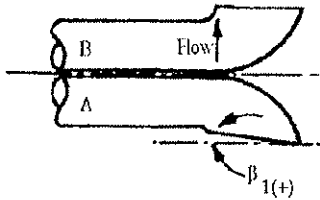
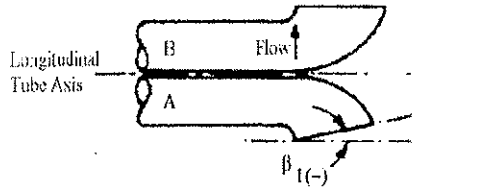
Pre-Sample

10/27/2012

Post-Sample

Date: \_\_\_\_\_

8/15/2013



Y	level?	Y
N	obstructions?	N
N	damaged?	N
0	$-10^\circ < \alpha_1 < +10^\circ$	0
0	$-10^\circ < \alpha_2 < +10^\circ$	1
0	$-5^\circ < \beta_1 < +5^\circ$	0
1	$-5^\circ < \beta_2 < +5^\circ$	1
0	$\gamma$	1
2	$\theta$	0
0.680	A	0.68
0.340	$0.2625 < P_A < 0.375$	0.340
0.340	$0.2625 < P_B < 0.375$	0.340
0.250	$0.1875 \leq D_t \leq 0.375$	0.250
0.000	$A \tan \gamma < 0.125"$	0.012
0.02374	$A \tan \theta < 0.03125"$	0.00000
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

**Comments:** 10' effective length M5 probe with s-type pitot tube, 1.4" tips, K-type thermocouple enclosed in a 1.5" OD sheath.

Pitot tube/probe number 354 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

  
8/15/13

D-5

**ARI Environmental Inc.**  
**Thermocouple Calibration Data Form**



Calibrator: B. Crane  
 Thermocouple ID. 354  
 Date:                      pretest                      posttest  
                                  10/27/2012                      8/15/2013  
 Barometric:              29.57                      29.41  
 Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre- Test	T.C	Ice Water	32.0	32.0	0.00
		Ambient	67.4	67.3	0.02
		Heat Source	300.0	299.2	0.11
Post- Test	T.C	Ice Water	32.1	32.0	0.02
		Ambient	74.2	74.5	-0.06
		Heat Source	296.8	297.1	-0.04

$$a \text{ (temp. diff.)} = (\text{ref.temp} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$$

Where  $-1.5 < a < 1.5$



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## APPENDIX E

## Process Data

---

# MAIN BODY Process Data Summary Tables

Consent Decree

Run	PM10-1	PM10-2	PM10-3	PM10-4	Test Average
Total Feed Rate, BPD	80	80	80	81	80
FCCU Regenerator Coke Burn, lb/hr	49025	50199	50236	50439	49975
Ammonia Flow to ESP, lb/hr	151	178	180	180	172
ESP Total Primary Power, KW	149	150	151	149	150
ESP Total Secondary Current, Amps	4916	4842	4850	4804	4853
SO2, ppm @ 0%O2	3.0	2.6	2.6	2.8	3
NOx, ppm @ 0%O3	30.5	34.0	32.1	31.4	32
SO2 Additive Rate, PPD	100	150	150	150	137
Ammonia Slip (Calc), ppm	8.1	9.0	9.0	9.0	8.8
Regenerator Plenum Outlet Temperature, F	1302	1310	1312	1315	1310
Average ESP Inlet Temperature, F	665	661	664	667	664



[illegible]

ECU 500 AUG 2013 NSPS JO CO Test Data v0A.0A.13\_KV/D\_v07



BP Whiting Refinery  
FCCU 500  
Test Dates: 8/7 & 8/8/13

## **APPENDIX F**

## **Test Program Qualifications**

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## **Test Program Qualifications**

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ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-12-4), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

### **Steven Flaherty**

Mr. Flaherty is a Senior Project Manager with ARI. His 11 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

### **Robert Burton**

Mr. Burton is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Burton has 6 years of experience in conducting various source emission test programs. Mr. Burton is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

### **W. Alex Hildreth**

Mr. Hildreth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

### **Tim Martch**

Mr. Martch is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

### **Brett O'Leary**

Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

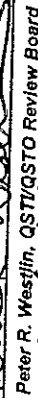
**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

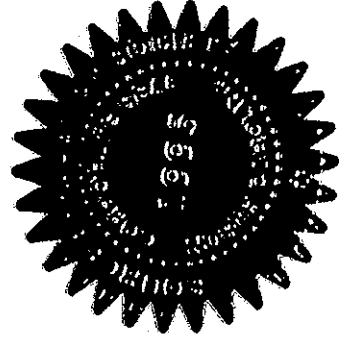
ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2013

  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
John R. Smith, QSTI/QSTO Review Board



APPLICATION  
NO.

2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

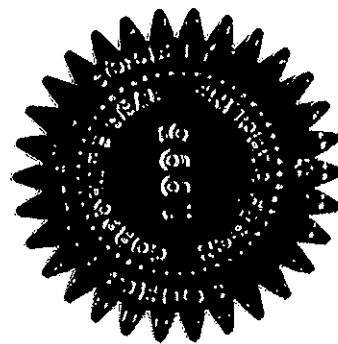
**MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**


ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2013


  
Peter R. Westlin, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

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2008-237



  
John R. Smith, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

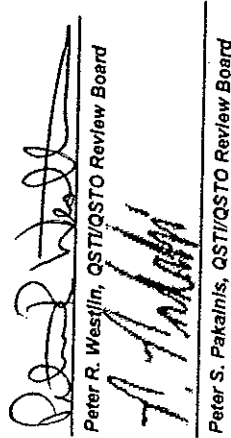
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EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2013

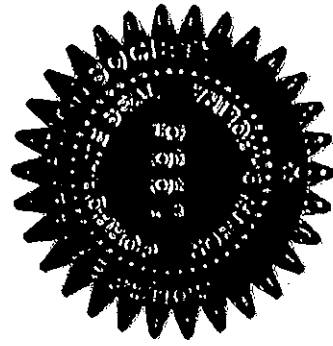
  
Peter R. Westlin, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

  
John R. Smith, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual


LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

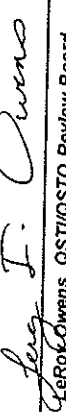
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR


### **HAZARDOUS METALS MEASUREMENT SAMPLING METHODS**

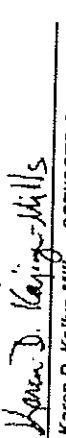
ISSUED THIS 18<sup>TH</sup> DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17<sup>TH</sup>, 2016


  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

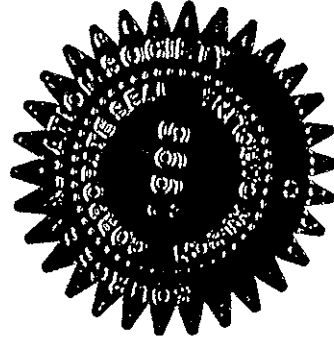
  
Greg T. Owens, QSTI/QSTO Review Board

  
C. David Bagweff, QSTI/QSTO Review Board

  
Karen D. Kallya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



# TEST REPORT

## COMPLIANCE EMISSION TEST NSPS, SUBPART Ja FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.  
WHITING, INDIANA

PREPARED FOR:

***BP PRODUCTS NORTH AMERICA, INC.***

Whiting Refinery  
2918 Indianapolis Blvd.  
Whiting, Indiana 46394  
Phone: 219.473.3725  
E-mail: Brandon.Mik@bp.com  
Attention: Mr. Brandon Mik



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Steve Flaherty  
Senior Project Manager  
Source Testing Division

ARI Project No. 566-80  
ARI Proposal No. 12313  
BP Purchase Order No. 3000251393  
Test Date: August 9, 2013



# TABLE OF CONTENTS

<b>SECTIONS</b>	<b>PAGE</b>
<b>REPORT CERTIFICATION</b>	ii
Section 1 <b>INTRODUCTION AND SUMMARY</b>	1-1
Section 2 <b>TESTING AND ANALYTICAL PROCEDURES</b>	2-1
2.1 Overview	2-1
2.2 Methodology	2-1
2.2.1 Sampling Locations (USEPA Method 1)	2-1
2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)	2-1
2.2.3 Molecular Weight (USEPA Method 3)	2-1
2.2.4 Flue Gas Moisture Content (USEPA Method 4)	2-1
2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)	2-2
2.2.5.1 Sampling Apparatus	2-2
2.2.5.2 Sampling Procedures	2-2
2.2.5.3 Sample Recovery Procedures	2-4
2.2.5.4 Analytical Procedures	2-4
2.3 Particulate Matter Emission Rate Calculation Procedure	2-5
Section 3 <b>PROCESS DESCRIPTION</b>	3-1
Section 4 <b>TEST RESULTS</b>	4-1
<b>FIGURES</b>	
Figure 2-1 USEPA Method 5F Nonsulfate Particulate Matter Sampling Train	2-3
<b>TABLES</b>	
Table 1-1 Summary of FCCU 500 Stack Nonsulfate PM Test Results	1-1
Table 3-1 FCCU 500 Process and Stack CEMS Data Summary	3-1
Table 4-1 FCCU 500 Stack Nonsulfate PM Emission Test Results	4-2
<b>APPENDICES</b>	
Appendix A Calculation Summaries	
Appendix B Field Data	
Appendix C Analytical Data	
Appendix D Calibration Data	
Appendix E Process Data	
Appendix F Test Program Qualifications	



## REPORT CERTIFICATION

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### STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

A handwritten signature in black ink, appearing to read "Steve Flaherty", is written over a horizontal line.

Steve Flaherty, QSTI  
Senior Project Manager, Source Testing Division  
ARI Environmental, Inc.

A handwritten signature in black ink, appearing to read "Hank Taylor", is written over a horizontal line.

Hank Taylor, QI  
Quality Assurance Manager, Source Testing Division  
ARI Environmental, Inc.



## SECTION ONE

## Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on August 9, 2013.

Three 60-minute test runs were conducted on the FCCU 500 stack to determine the concentration and emission rate of filterable nonsulfate PM. The emission test was performed to fulfill the testing requirements of the New Source Performance Standards (NSPS), Subpart Ja.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Brandon Mik of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Rob Burton, Alex Hildreth, Tim Martch and Brett O'Leary of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

**TABLE 1-1. SUMMARY OF FCCU 500 STACK NONSULFATE PM TEST RESULTS**

TEST RUN NO.	:	5F-1*	5F-2	5F-3	
TEST DATE	:	8/9/13	8/9/13	8/9/13	
TEST TIME	:	<u>10:45-11:51</u>	<u>12:45-13:53</u>	<u>14:55-16:08</u>	<u>Average</u>
<b><u>Nonsulfate Filterable PM</u></b>					
Concentration					
grains/dscf		0.0500	0.0194	0.0229	0.0308
mg/dscm		114.512	44.481	52.327	70.440
Emission rate (as measured)					
lb/hr		86.34	32.26	39.37	52.66
lb/1,000 lb coke burn		1.355	0.511	0.619	0.828
Prorated soot blow emission rate					
lb/hr					36.72
lb/1,000 lb coke burn					0.579

\*A soot blow was conducted during Run No. 5F-1.



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana.

Three 60-minute test runs were conducted on August 9, 2013 to determine the concentration and emission rate of filterable nonsulfate PM.

### 2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

#### 2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted using the two (2) sampling ports provided in the 108-inch inside diameter stack. The sample ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

#### 2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

#### 2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations of each collected bag. The nitrogen (N<sub>2</sub>) content was calculated as the difference.

#### 2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Method 5F procedures described in Subsection 2.2.5.



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)

Nonsulfate PM sampling was conducted in accordance with USEPA Method 5F using an Apex Instruments, Inc. sampling train.

#### 2.2.5.1 Sampling Apparatus

The PM sampling train met design specifications established by the USEPA. Assembled by ARI personnel, it consisted of the following:

Nozzle – Stainless steel, with sharp, tapered leading edge.

Probe – Stainless steel with a heating system capable of maintaining a probe exit temperature of 320°F ±25°F.

Pitot Tube - Type-S attached to probe for monitoring stack gas velocity.

Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 320°F ±25°F during sampling.

Draft Gauge – Inclined manometer with a readability of 0.01-in. H<sub>2</sub>O in the 0 to 1-in. range and 0.1-in. H<sub>2</sub>O in the 1 to 10-in. range.

Impingers – Four (4) impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second impinger was of the Greenburg-Smith design with a standard tip.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

#### 2.2.5.2 Sampling Procedures

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture and range of velocity differential pressure ( $\Delta P$ ) were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers initially contained 100 milliliters (mL) of deionized/distilled water. The third impinger was initially empty. The fourth impinger contained 200 grams of silica gel. The train was set up with the probe and filter holder as shown in Figure 2-1.

## SECTION TWO

## Testing and Analytical Procedures

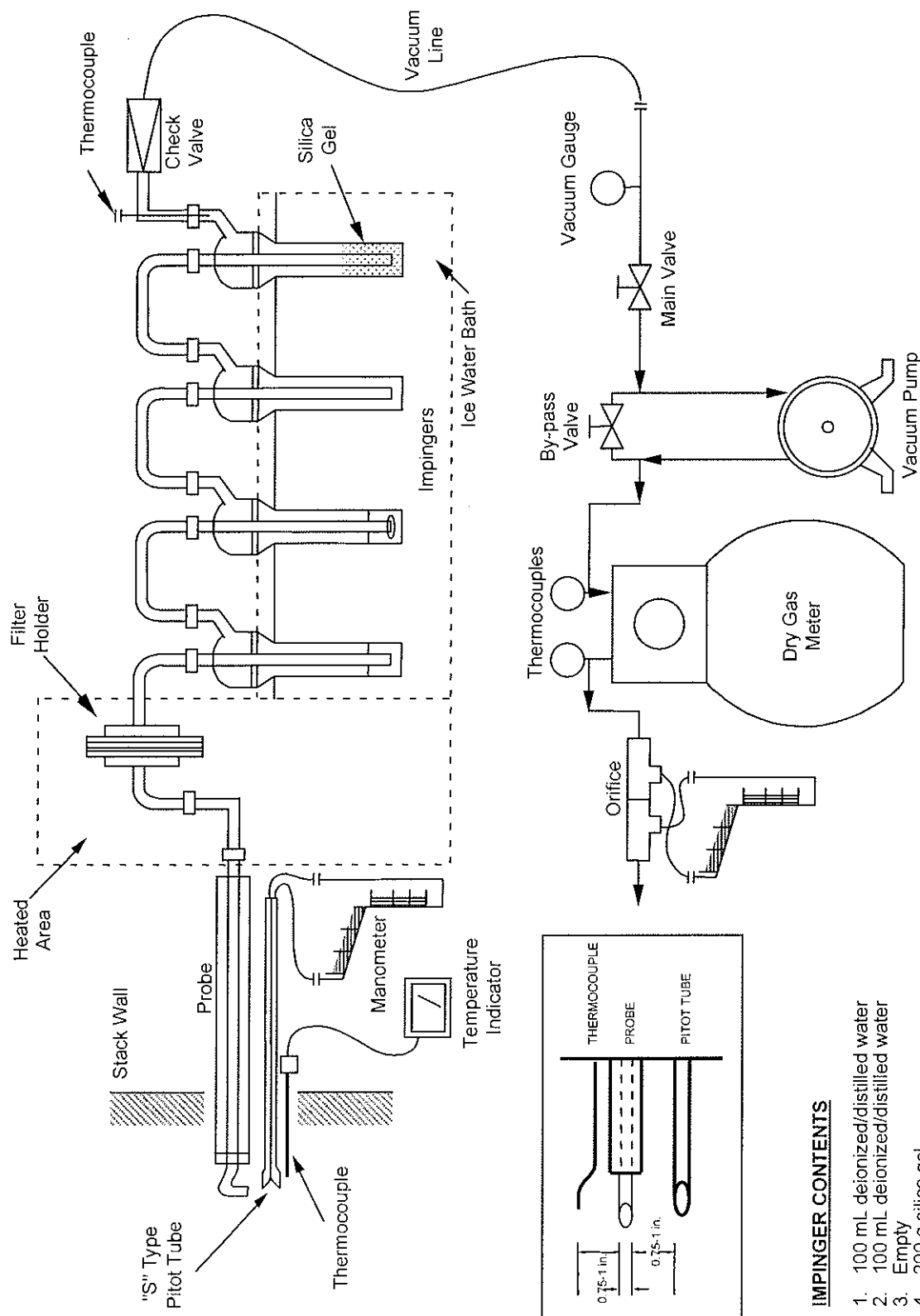


FIGURE 2-1. USEPA METHOD 5F NONSULFATE PARTICULATE MATTER SAMPLING TRAIN

## SECTION TWO

## Testing and Analytical Procedures

---

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft<sup>3</sup>/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

### 2.2.5.3 Sample Recovery Procedures

After sampling was completed and the final leak checks performed, the filter and probe (front-half) were disconnected from the impinger train. The sample fractions were recovered as follows:

Container 1 - The filter holder was sealed.

Container 2 - Loose PM and deionized/distilled water washings from all sample-exposed surfaces prior to the filter were placed in a glass jar, sealed and labeled. PM was removed from the probe liner, nozzle and fitting with the aid of a brush and deionized/distilled water rinsing. The liquid level was marked after the container was sealed.

Container 3 - A minimum of 200 mL of deionized/distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

The contents of impingers 1 through 3 were measured for volume and then discarded. The contents of the fourth impinger (silica gel) were placed in a polyethylene bottle for subsequent weighing to the nearest gram.

### 2.2.5.4 Analytical Procedures

The analytical procedures followed those described in USEPA Method 5F.

The filter from Container 1 was cut into small pieces and placed in a 125 mL Erlenmeyer flask equipped with an air condenser. The sample container was rinsed with water and placed into the same flask as the filter pieces. The contents of the flask were refluxed on a hot plate for 6 to 8 hours. The solution was then cooled and transferred to a 500 mL volumetric flask. The contents of Container 2 (probe rinse) were placed in the 500 mL volumetric flask with the filter solution. The contents were then diluted to exactly 500 mL with water.

The sample was allowed to settle, and then a pipette was used to deliver 5 mL of the solution into a 50 mL volumetric flask. The aliquot was diluted to exactly 50 mL with water. The final solution was analyzed in duplicate by ion chromatography for sulfate content (SO<sub>4</sub><sup>2-</sup>). The duplicate samples agreed within 5% of their mean and were compared to a 5-point standard calibration curve.

## SECTION TWO

## Testing and Analytical Procedures

After the sulfate analysis, the remaining contents of the volumetric flask were transferred to a tared 250 mL beaker. The flask was carefully rinsed with water to make sure that all PM was transferred to the tared beaker. The beaker was transferred to an oven and heated to 105°C until approximately 100 mL of solution remained. The beaker was allowed to cool, after which five (5) drops of phenolphthalein indicator were added. Concentrated ammonium hydroxide was added until the solution turned pink. The sample was returned to the oven and evaporated to dryness at 105°C. The sample was then cooled, placed in a desiccator and subsequently weighed to a constant weight.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

### 2.3 PARTICULATE MATTER EMISSION RATE CALCULATION PROCEDURE

Representative averaging of emission rates accommodated one 3-minute soot blowing cycle during the first test run. The following equation (excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979) was used for calculations:

$$E_{pave} = E_{sbr} \left( \frac{(A + B)S}{AR} \right) + E_{nosb} \left( \frac{R - S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$	=	Average E for daily operating time
$E_{sbr}$	=	Average E of sample(s) containing soot blowing
$E_{nosb}$	=	Average E of sample(s) with no soot blowing
A	=	Hours of soot blowing during sample run
B	=	Hours not soot blowing during sample run
R	=	Average hours of operating per 24 hours
S	=	Average hours of soot blowing per 24 hours



## SECTION THREE

## Process Description

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

**TABLE 3-1. FCCU 500 PROCESS AND STACK CEMS DATA SUMMARY**

TEST RUN NO.	5F-1	5F-2	5F-3	Average
FCCU Regenerator Coke Burn, lb/hr	63,695	63,186	63,581	63,487
ESP Total Primary Power, KW	96	94	95	95
ESP Total Secondary Current, Amps	2,973	2,978	2,975	2,975
SO <sub>2</sub> , ppm @ 0% O <sub>2</sub>	6.1	6.4	6.6	6.3
NO <sub>x</sub> , ppm @ 0% O <sub>2</sub>	39.4	33.0	32.7	35.0



## **SECTIONFOUR**

---

## **Test Results**

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.



## SECTION FOUR

## Test Results

**TABLE 4-1. FCCU 500 STACK NONSULFATE PM EMISSION TEST RESULTS**

TEST RUN NO.	:	5F-1*	5F-2	5F-3	
TEST DATE	:	8/9/2013	8/9/2013	8/9/2013	
TEST TIME	:	<u>10:45-11:51</u>	<u>12:45-13:53</u>	<u>14:55-16:08</u>	<u>Average</u>

### Stack Gas Parameters

Temperature, °F	661.3	660.8	600.9	641.0
Velocity, av. ft/sec	146.9	142.3	141.1	143.4
Volumetric flow, acfm	560,603	543,256	538,692	547,517
Volumetric flow, scfm	260,752	252,796	264,825	259,457
Volumetric flow, scfh	15,645,102	15,167,736	15,889,509	15,567,449
Volumetric flow, dscfm	201,254	193,615	200,856	198,575
Volumetric flow, dscfh	12,075,229	11,616,881	12,051,344	11,914,485
Mass flow, Mlb/hr db	964.5	928.6	964.0	952.3
Moisture, av. % vol	22.8	23.4	24.2	23.5
Molecular weight, lb/lb-mole db	30.77	30.80	30.82	30.79
Carbon Dioxide, av. % vol	16.7	16.9	17.0	16.9
Oxygen, av. % vol	2.5	2.3	2.4	2.4

### Particulate Sample

Time, min.	60.0	60.0	60.0	60.0
Volume, dscf	48.338	46.167	48.181	47.562
Filterable nonsulfate PM, mg	156.74	58.15	71.39	95.43
Isokinetic ratio, %	98.3	97.6	98.2	98.0

### Nonsulfate Filterable PM

Concentration				
grains/dscf	0.0500	0.0194	0.0229	0.0308
mg/dscm	114.512	44.481	52.327	70.440
lb/dscf x 10 <sup>-6</sup>	7.150	2.777	3.267	4.398
Emission rate (as measured)				
lb/hr	86.34	32.26	39.37	52.66
lb/1,000 lb coke burn	1.355	0.511	0.619	0.828
Prorated soot blow emission rate				
lb/hr				36.72
lb/1,000 lb coke burn				0.579

\*A soot blow was conducted during Run No. 5F-1.



BP Whiting Refinery  
FCCU 500  
Test Date: 8/9/13

## **APPENDIX A**

## **Calculation Summaries**

---



**USEPA Method 2**  
**Volumetric Flow Rate Sample Calculations (Circular Ducts)**

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 8/9/2013  
**Run #:** 5F-1

**Data Input**

Carbon Dioxide (CO <sub>2</sub> ):	16.7 %
Oxygen (O <sub>2</sub> ):	2.5 %
Nitrogen (N <sub>2</sub> ):	80.8 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2282 dimensionless
Stack Temperature (T <sub>s</sub> ):	661.3 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.7525 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.65 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Dry molecular weight of stack gas:**

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.772 \text{ lb/lb-mole}$$

**Molecular weight of stack gas, wet basis:**

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.858 \text{ lb/lb-mole}$$

**Absolute stack gas pressure:**

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.554 \text{ inches H}_2\text{O}$$

**Stack gas velocity:**

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 146.869 \text{ feet/second}$$

**Stack gas volumetric flow rate:**

$$Q_a = A_s \times V_s \times 60 = 560,603 \text{ acfm}$$

**Stack gas volumetric flow rate, wet basis:**

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 260,752 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 15,645,102 \text{ scfh}$$

**Stack gas volumetric flow rate, dry basis:**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 201,254 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 12,075,229 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-1

## Data Input:

Volume metered ( $V_m$ ):	52.170 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg
Meter sample rate ( $\Delta H$ ):	1.99 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	107.5 °F
Volume of moisture collected ( $V_{lc}$ ):	303.6 milliliters
Stack Temperature ( $T_s$ ):	661.3 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ "Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 48.338 \text{ dscf}$$

### Volume of water vapor in sample:

$$VW_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 14.290 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{VW_{std}}{(Vm_{std} + VW_{std})} = 0.2282 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 22.82 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(^{\circ}K)} = ((T_s - 32) \times 0.5556) + 273 = 622.6 \text{ }^{\circ}\text{Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 753.14 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( A \left( \frac{B}{(T_{s(^{\circ}K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 200.3142 B_{wo}$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$= 22.82 \%$$



# USEPA Method 5F (Non-Sulfate PM) Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-1

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg	<u>Particulate Weight:</u>	
Stack pressure ( $P_s$ ):	29.55 inches Hg Abs.	Filterable:	156.74 milligrams
Test length (t):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2180 inches		
Sample nozzle area ( $A_n$ ):	0.000259 $ft^2$		
Stack temperature ( $T_s$ ):	661.3 °F		
Volume metered ( $V_{mstd}$ ):	48.338 $ft^3$		
Stack gas velocity ( $V_s$ ):	146.869 feet/second	Coke Burn Rate:	63,695 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	12,075,229 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2282 %		

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wo})} = 98.3 \% \text{ isokinetic}$$

### Method 5-F Particulate Concentration:

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0500 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 114.5119 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 7.150 \times 10^{-6} \text{ lb/dscf}$$

### Method 5-F Particulate Emission Rate:

$$E_p = C_s^1 \times Q_{std} = 86.337 \text{ lb/hr}$$

$$pmr_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 1.3555 \text{ lb}/1000\text{lb coke burn}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-2

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	16.9 %
Oxygen (O <sub>2</sub> ):	2.3 %
Nitrogen (N <sub>2</sub> ):	80.8 %
Fractional Moisture Content (B <sub>wo</sub> )	0.2341 dimensionless
Stack Temperature (T <sub>s</sub> ):	660.8 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.6969 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.65 inches Hg
Static Pressure (S <sub>i</sub> )	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.796 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.800 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.554 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 142.324 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 543,256 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 252,796 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 15,167,736 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 193,615 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 11,616,881 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-2

## Data Input:

Volume metered ( $V_m$ ):	50.045 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg
Meter sample rate ( $\Delta H$ ):	1.86 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	109.8 °F
Volume of moisture collected ( $V_{lc}$ ):	299.8 milliliters
Stack Temperature ( $T_s$ ):	660.8 °F
Static Pressure ( $St$ ):	-1.3 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 46.167 \text{ dscf}$$

### Volume of water vapor in sample:

$$VW_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 14.112 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{VW_{std}}{(Vm_{std} + VW_{std})} = 0.2341 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 23.41 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 622.4 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 753.14 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( A \left( \frac{B}{(T_{s(K)} - C) \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 199.6297 B_{wo}$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$= 23.41 \%$$



# USEPA Method 5F (Non-Sulfate PM) Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-2

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg	<u>Particulate Weight:</u>	
Stack pressure ( $P_s$ ):	29.55 Inches Hg Abs.	Filterable:	58.15 milligrams
Test length ( $\theta$ ):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2180 inches		
Sample nozzle area ( $A_n$ ):	0.000259 $ft^2$		
Stack temperature ( $T_s$ ):	660.8 $^{\circ}F$		
Volume metered ( $V_{mstd}$ ):	46.167 $ft^3$		
Stack gas velocity ( $V_s$ ):	142.324 feet/second	Coke Burn Rate:	63,186 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	11,616,881 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2341 %		

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 $^{\circ}F$ ):

### Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 97.6 \% \text{ isokinetic}$$

### Method 5-F Particulate Concentration:

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0194 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 44.4812 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 2.777 \times 10^{-6} \text{ lb/dscf}$$

### Method 5-F Particulate Emission Rate:

$$E_p = C_s^1 \times Q_{std} = 32.264 \text{ lb/hr}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.5106 \text{ lb/1000lb coke burn}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-3

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.0 %
Oxygen (O <sub>2</sub> ):	2.4 %
Nitrogen (N <sub>2</sub> ):	80.6 %
Fractional Moisture Content (B <sub>wo</sub> )	0.2416 dimensionless
Stack Temperature (T <sub>s</sub> ):	600.9 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.7270 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.65 inches Hg
Static Pressure (S <sub>i</sub> )	-1.30 inches H <sub>2</sub> O
Stack diameter:	108.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.816 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_{si} = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.720 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.554 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 141.128 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 538,692 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 264,825 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 15,889,509 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 200,856 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 12,051,344 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 8/9/2013  
**Run #:** 5F-3

### Data Input:

Volume metered ( $V_m$ ):	51.995 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg
Meter sample rate ( $\Delta H$ ):	1.96 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	107.4 °F
Volume of moisture collected ( $V_{lc}$ ):	326.0 milliliters
Stack Temperature ( $T_s$ ):	600.9 °F
Static Pressure ( $S_t$ ):	-1.3 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ "Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 48.181 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 15.345 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2416 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 24.16 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 589.1 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 753.14 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( \frac{A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 0.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 129.2676 B_{wo}$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 24.16 \%$$



# USEPA Method 5F (Non-Sulfate PM) Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 8/9/2013  
Run #: 5F-3

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.65 inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.55 Inches Hg Abs.	Filterable:	71.39 milligrams
Test length ( $\theta$ ):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2180 inches		
Sample nozzle area ( $A_n$ ):	0.000259 $ft^2$		
Stack temperature ( $T_s$ ):	600.9 °F		
Volume metered ( $V_{mstd}$ ):	48.181 $ft^3$		
Stack gas velocity ( $V_s$ ):	141.128 feet/second	Coke Burn Rate:	63,581 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	12,051,344 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2416 %		

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 98.2 \% \text{ isokinetic}$$

### Method 5-F Particulate Concentration:

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0229 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 52.3266 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 3.267 \times 10^{-6} \text{ lb/dscf}$$

### Method 5-F Particulate Emission Rate:

$$E_p = C_s^1 \times Q_{std} = 39.374 \text{ lb/hr}$$

$$pmr_{lb/1000lb \text{ coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.6193 \text{ lb/1000lb coke burn}$$

**PARTICULATE EMISSIONS PRORATION PROCEDURES**  
(Excerpted from memo to all US EPA Regions from E. Reich dated March 6, 1979):

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 8/9/2013  
**Run #:** 5F-1

*The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):*

$$E_{pave} = E_{sbr} \left( \frac{(A+B)S}{AR} \right) + E_{nosb} \left( \frac{R-S}{R} - \frac{BS}{AR} \right)$$

Where:

$E_{pave}$  = average E for daily operating time  
 $E_{sbr}$  = average E of sample(s) containing soot blowing  
 $E_{nosb}$  = average E of sample(s) with no soot blowing  
A = hours of soot blowing during sample(s)  
B = hours not blowing during sample(s) containing soot blowing  
R = average hours of operating per 24 hours  
S = average hours of sootblowing per 24 hours

**Test and Sootblowing Data:**

<b>Run</b>	5F-1	
<b>Date</b>	8/9/2013	
<b>Run time</b>	10:45-11:51	
<b>Soot blow time</b>	10:57-11:00	
<b>Soot blow duration</b>	3 minutes	
Average E of sample(s) containing soot blowing, ( $E_{sbr}$ ):	86.337 total lb/hr	1.3555 lb/1000lb coke burn
Average E of sample(s) with no soot blowing, ( $E_{nosb}$ ):	35.819 total lb/hr	0.5649 lb/1000lb coke burn
Hours of soot blowing during sample(s), (A):	0.050 hours	
Hours not blowing soot during sample(s) containing soot blowing, (B):	0.950 hours	
Average hours of operating per 24 hours, (R):	24.000 hours	
Average hours of soot blowing per 24 hours, (S):	0.0214 hours	

**Test Program Pro-rated Results:**

<b>Filterable Nonsulfate PM Emissions:</b>	= 36.720 average lb/hr
	= 0.5790 average lb/1000lb coke burn



BP Whiting Refinery  
FCCU 500  
Test Date: 8/9/13

## **APPENDIX B**

## **Field Data**

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SB 1057-1100

11-5-23

## FIELD DATA

Form FDF 4003.00



# FIELD DATA

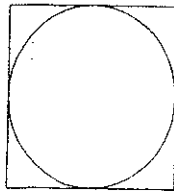
B-2

PLANT BP Whiting  
DATE 8-9-13  
LOCATION Whiting, IN  
OPERATOR FM WH  
STACK NO PCU 500  
RUN NO 5A-2  
SAMPLE BOX NO APEX  
METER BOX NO 40827  
START TIME 1245

AMBIENT TEMPERATURE  
BAROMETRIC PRESSURE  
ASSUMED MOISTURE, %  
PROBE LENGTH, in.  
NOZZLE DIAMETER, in.  
STACK DIAMETER, in.  
MINUTES PER POINT  
NUMBER OF PORTS

PROBE HEATER SETTING 320  
HEATER BOX SETTING 320  
METER H<sub>2</sub>O 1.58  
C<sub>0</sub> FACTOR 0.54  
Y<sub>d</sub> FACTOR 1.000  
PITOT NO. 354

WEIGHT OF PARTICULATE, mg  
Filter No. 5268  
Sample  
Final wt  
Tare wt  
Wt. gain



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (S) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>s</sub> ) °F	VELOCITY HEAD		DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H <sub>2</sub> O	GAS SAMPLE VOLUME (V <sub>m</sub> ) ft <sup>3</sup>	GAS SAMPLE DRY GAS METER		FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	IMPINGING OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
					(ΔP <sub>s</sub> )	(ΔP <sub>g</sub> )			INLET (T <sub>m,i</sub> ) °F	OUTLET (T <sub>m,o</sub> ) °F					
1245	1	0	-1.3	660	2.6	2.6	1.7	415.635	103	104	320	320	-	65	4
1250	2	5		659	2.7	2.7	1.8	420.39	114	105	310	316		53	4
1255	3	10		659	3.0	3.0	1.6	424.21	110	105	315	314		55	4
1300	4	15		660	3.2	3.2	2.1	427.97	114	104	323	310		57	5
1305	5	20		662	3.1	3.1	2.0	431.98	115	105	327	310		58	5
1310	6	25		663	3.1	3.1	3.0	436.10	115	106	321	307		60	4
1323	5	30		661	2.5	2.5	1.8	440.05	109	106	310	311		65	4
1328	2	35		660	2.7	2.7	1.6	443.62	116	107	309	307		56	5
1333	3	40		659	3.0	3.0	1.9	447.72	117	107	325	311		59	5
1338	4	45		661	3.0	3.0	2.0	452.14	117	107	322	305		61	5
1343	5	50		662	2.9	2.9	1.9	456.74	117	107	315	311		63	5
1348	6	55		663	2.8	2.8	1.8	461.10	117	108	315	316		63	5
1353		60						465.680							
AVERAGE	12	60	-1.3	660.8	✓	✓	1.86	50.045	✓	✓	✓	109.8		≤ 68	Max 5

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGING VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL	324	158	5			2128
INITIAL	100	100	0	50		300
LIQUID COLLECTED	224	58	5			128
TOTAL LIQUID COLLECTED (specify ml or g)	299.8					

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		16.9	2.3
TRIAL 2		16.9	2.3
TRIAL 3		16.9	2.3
Average		16.9	2.3

LEAK CHECK	
SYSTEM PRE: 0.000	CFM @ 15" Hg
POST: 0.000	CFM @ 15" Hg
PITOT PRE: 4/-0K	@ > 3" H <sub>2</sub> O
POST: 4/-0K	@ > 3" H <sub>2</sub> O



## FIELD DATA

90	PROBE HEATER SETTING	320
24.05	HEATER BOX SETTING	320
25.0	METER $H_2$	1.28
120	$C_2$ FACTOR	0.84
0.218	$Y_2$ FACTOR	1.00
108	PITOT NO.	354
5		
12		
7		

WEIGHT OF PARTICULATE, mg		mg
Filter No.	Sample	
	Final wt	
	Tare wt	
	Wt. gain	
TOTAL		

**PRESSURE  
DIFFERENTIAL**

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME ( $\Theta$ ) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°C)/F	VELOCITY HEAD	
					(ΔP <sub>s</sub> )	(ΔP <sub>a</sub> )
1455	5	0	-1.3	660	2.6	
1500	3	5		660	3.2	
1505	3	10		659	3.5	
1510	4	15		661	3.4	
1515	5	20		663	3.4	
1520	6	25		664	3.2	
1543	w	30		663	2.6	
1548	2	35		659	2.6	
1553	3	40		659	2.7	
1558	4	45		660	2.8	
1603	5	50		661	2.8	
1608	6	55		662	3.1	
		60				
AVERAGE	12	60	-1.3	660.9		1.7270

GAS SAMPLE VOLUME (V <sub>m</sub> ) n°	GAS SAMPLE TEMP AT DRY GAS METER		FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
	INLET (T <sub>inlet</sub> ) °F	OUTLET (T <sub>outlet</sub> ) °F					
465.920	108	108	312	315	-	67	6
469.84	116	108	313	317		59	7
474.03	118	108	321	318		60	7
478.58	117	107	325	312		63	7
483.03	115	107	326	308		68	7
487.57	117	107	320	310		66	7
491.95	111	108	312	310		67	6
496.00	116	108	308	311		62	6
500.25	113	106	317	316		67	8
504.63	118	109	323	318		67	8
509.08	118	109	318	316		67	7
513.48	118	109	320	318		68	7
517.915							

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL	344	170	0			22.0
INITIAL	100	100	0	50	-	200
LIQUID COLLECTED	178+					
TOTAL LIQUID COLLECTED (specify ml or g)	326.0					

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		17.0	2.4
TRIAL 2		17.6	2.4
TRIAL 3		17.0	2.4
Average		17.0	2.4

LEAK CHECK	
SYSTEM PRE:	0.39g CFM @ 15" Hg
POST:	0.02g CFM @ 15" Hg
PITOT PRE:	4/- 0K @ > 3" H <sub>2</sub> O
POST:	4/- 0K @ > 3" H <sub>2</sub> O



# TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting  
Date 8-7-13  
Sampling Location PUV500  
Inside of Far Wall to  
Outside of Port (Distance C) 114.5 in.  
Inside of Near Wall to  
Outside of Port (Distance D) 6.5 in.  
Stack ID (Distance C-Distance D) 108 in.  
Port Distance Downstream From Disturbance (B) 1368 in.  
Port Distance Upstream From Disturbance (A) 720 in.  
Equivalent Diameters Downstream From Disturbance (B) 12.67 ( $\geq 2.0$ )  
Equivalent Diameters Upstream From Disturbance (A) 6.67 ( $\geq 0.5$ )  
Number of Ports Used 2 Traverse Points / Port 6

B-4

Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = 12.67  
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = 6.67  
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =  
[ $(2 \times L \times W) / (L + W)$ ]

Port ID 6 in. (for monorail bracket specs.)  
Port Length Outside of Stack 4 in. (for monorail bracket specs.)

1 2 3 4 5 6

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	108	4.75	6.5	11.25
2	0.146		15.77		22.27
3	0.296		31.97		38.47
4	0.704		26.03		82.53
5	0.854		92.23		98.73
6	0.956		103.25		109.75
7					
8					
9					
10					
11					
12					

For Stacks / Ducts  $\leq 24$  inches ID - No traverse point shall be located less than 0.5 inches from stack wall

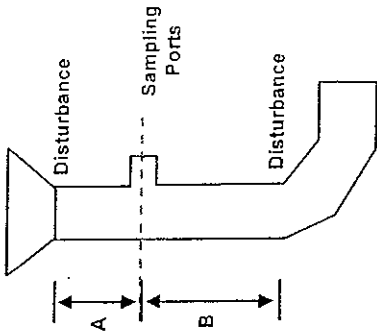
For Stacks / Ducts  $> 24$  inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:

Completeness \_\_\_\_\_ Legibility \_\_\_\_\_ Accuracy \_\_\_\_\_ Specifications \_\_\_\_\_

Method 1 Calculator Signature/Date WAH under photo 8-7-13

Field Supervisor Signature/Date \_\_\_\_\_



LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

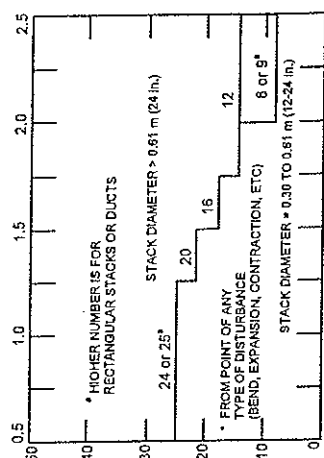
Pts	4	5	8	10	12
1	6.7	4.4	3.2	2.8	2.1
2	25.0	14.8	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.8	17.7
5	85.4	67.7	34.2	25.0	
6	95.6		60.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9			91.8	82.3	
10			97.4	88.2	
11				93.3	
12				97.9	

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

Pts	2	3	4	5	6	7	8	9
1	25.0	18.7	12.5	10.0	8.3	7.1	5.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3	83.3	62.5	50.0	41.7	35.7	31.3	27.8	
4		87.5	70.0	58.3	50.0	43.8	38.9	
5			90.0	75.0	64.3	56.3	50.0	
6				91.7	78.6	68.8	61.1	
7					92.9	81.3	72.2	
8						93.8	83.3	
9							94.4	

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

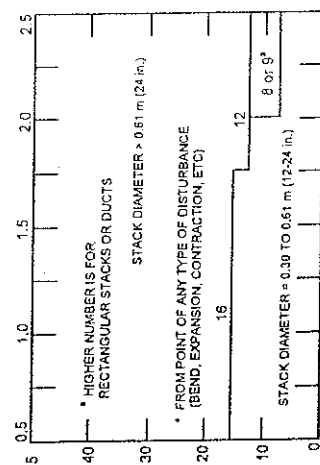
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS  
ISO-KINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS  
FOR VELOCITY (NON-ISO-KINETIC) TRAVERSES

# VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT Bp Whiting  
DATE 2-13-13  
LOCATION Whiting, IN  
SOURCE FCU 500  
STACK ID 108  
PROBE #/TC # 354  
BAROMETRIC PRESSURE, in. Hg 29.20  
OPERATORS WAT

### SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. Prelim  
 STATIC, in. H<sub>2</sub>O -1.4  
 START: 0811 STOP: 0815  
 PRE-TEST: +/-05 POST-TEST: +/-05

RUN NO. \_\_\_\_\_  
 STATIC, in. H<sub>2</sub>O \_\_\_\_\_  
 START: \_\_\_\_\_ STOP: \_\_\_\_\_  
 PRE-TEST: \_\_\_\_\_ POST-TEST: \_\_\_\_\_

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
6	2.5	637	13
5	3.0	637	9
4	3.1	637	5
3	3.2	637	5
2	3.3	637	8
1	3.0	637	10
6	2.7	637	9
5	3.0	637	6
4	3.0	637	3
3	3.3	637	0
2	3.1	637	1
1	2.9	637	4
AVERAGE	2.440	637.0	42.0°

[illegible]



## SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 8-7-13

Nozzle Clean: (Y) N

Nozzle ID: SS 201A / SS 0.218

Nozzle Undamaged: (Y) N

Nozzle Type: PM<sub>10</sub> / SS

Absent of Nicks or Dents: (Y) N

Inspected By: RB

Leading Edge Sharp: (Y) N

Nozzle Diameter			$\Delta D$ (inches)	$D_{avg}$ (inches)
$D_1$ (inches)	$D_2$ (inches)	$D_3$ (inches)		
<u>0.148</u>	<u>0.147</u>	<u>0.148</u>	<u>0.001</u>	<u>0.148</u>
<u>0.218</u>	<u>0.218</u>	<u>0.218</u>	<u>0.006</u>	<u>0.218</u>

where:

$D_{1,2,3}$  = three different nozzle diameter measurements, (inches); each diameter must be measured to within 0.001 inches

$\Delta D$  = maximum difference between any two diameters, (inches);  $\Delta D \leq 0.004$  inches

$D_{avg}$  = average of  $D_1$ ,  $D_2$ , and  $D_3$ , (inches)



BP Whiting Refinery  
FCCU 500  
Test Date: 8/9/13

## **APPENDIX C**

## **Analytical Data**

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# ***ANALYTICAL REPORT***

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 8/9/13

Lab Project Number: 08-563

COC Numbers(s): W01453

Analysis Date(s): 8/12 - 8/19/13

Analytical Method(s): USEPA Method 5F

***Prepared For:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Project Mgr: Steve Flaherty  
Phone: 847-487-1580 x117  
Fax: 847-487-1587  
E-mail: sflaherty@arienv.com

***Prepared By:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Eric Vogt, Lab Manager  
Phone: 847-487-1580 ext.116  
Fax: 847-487-1587  
E-mail: evogt@arienv.com

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State of Texas TCEQ/NELAP Certificate ID: T104704428-12-4  
State of Louisiana LDEQ/LELAP Certificate ID: 02010  
State of New Jersey NJDEP Certification ID: IL007



## *Project Narrative*

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### ***Sample Receipt and Acceptance Quality Assurance:***

Eight (8) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 8/12/13. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

### ***Analytical Quality Assurance:***

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

### ***Data Interpretation and Comments:***

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

### ***Scope of Accreditation:***

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

### ***Laboratory Contact Information:***

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at [evogt@arienv.com](mailto:evogt@arienv.com).

Reviewed and Approved by:

  
\_\_\_\_\_  
Signature: Laboratory Manager

8/20/13  
Date



# ANALYTICAL SUMMARY

CLIENT: BP

LOCATION: Whiting, IN

SOURCE: FCCU-500

SAMPLE DATE: 8/9/2013

ANALYSIS: Particulates

METHOD: USEPA Method 5F

page 1 of 2

ANALYST: J. Ruggaber

DATE OF COMPLETION: 8/19/2013

TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3

PROJECT NUMBER: 08-563

Identification		LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Particulate (mg)	Blank Corrected Total Partic. (mg)
5F-1	FILTER	11256	875.0	115637.4	115637.9	-0.5	168.8	165.70
	BEAKER	11259	114593.8					
5F-2	FILTER	11257	880.2	115696.1	115696.5	-0.4	65.1	61.95
	BEAKER	11260	114751.0					
5F-3	FILTER	11258	881.4	114437.9	114438.3	-0.4	77.5	74.35
	BEAKER	11261	113479.2					
Water Blank	BEAKER	11255	883.5	121677.0	121677.1	-0.1	3.2	-
Filter Blank	FILTER	11254	120790.4					

## Sample Concentration Calculations

Identification	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Diluted SO <sub>4</sub> Conc. (µg/ml)	Dilution Factor	Sample Volume (mls)	SO <sub>4</sub> mass (µg)	Corrected for Aliquot (mg)	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> mass (mg)	Corrected for Blank (mg)
Run 1	0.1122	0.1147	0.1135	-1.10	1.47	10	500	7337.8	7.41	10.19	8.96
Run 2	0.0560	0.0561	0.0561	-0.09	0.73	10	500	3625.3	3.66	5.04	3.80
Run 3	0.0465	0.0468	0.0467	-0.32	0.60	10	500	3017.3	3.05	4.19	2.96
Field Blank	0.0133	0.0141	0.0137	-2.92	0.18	10	500	886.1	0.90	1.23	-
Lab DI Water Blank	<0.0070	<0.0070	<0.0070	0.00	<0.09	-	-	-	-	-	-

ID	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Actual Conc. (µg/ml)	Spike Conc. (µg/ml)	Theo. Spike Conc. (µg/ml)	R (%)	Pass/Fail
spike 1	0.1849	0.1812	0.183	1.01	2.37	1.05	1.00	104.8	Pass
spike 2	0.1883	0.1738	0.181	4.00	2.34	1.02	1.00	102.2	Pass

spike prep: 9 mL Run 1 + 1 mL of 10 ppm std

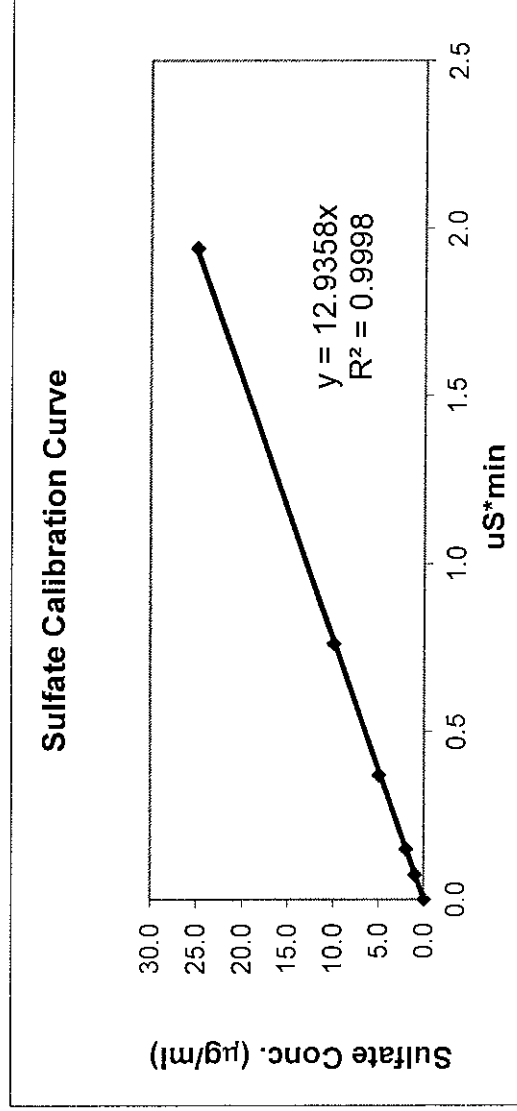
## Non-Sulfate Particulate Weight

Identification	Total Partic (mg)	Mass NH <sub>4</sub> SO <sub>4</sub> (mg)	Corrected Partic (mg)
Run 1	165.70	8.96	156.74
Run 2	61.95	3.80	58.15
Run 3	74.35	2.96	71.39

CLIENT: BP  
 LOCATION: Whiting, IN  
 SOURCE: FCCU-500  
 SAMPLE DATE: 8/9/2013  
 ANALYSIS: Particulates  
 METHOD: USEPA Method 5F

ANALYST: J. Ruggaber  
 DATE OF COMPLETION: 8/19/2013  
 TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3  
 PROJECT NUMBER: 08-563

Std. (µg/ml)	Pre Cal (µS*min)	Post Cal (µS*min)	Average (µS*min)	Deviation (%)	Conc (µg/ml)	Peak Area	RE	Cal Conc	% Dif
0.0	0.00	0.00	0.00	0.00	1.0	0.073	0.073	1.0	-2.69
1	0.072	0.074	0.073	-1.23	2.0	0.149	0.075	2.0	-0.56
2	0.147	0.152	0.149	-1.74	5.0	0.371	0.074	4.9	-1.36
5	0.361	0.381	0.371	-2.70	10.0	0.762	0.076	10.1	1.39
10	0.751	0.772	0.762	-1.35	25.0	1.938	0.078	25.8	3.22
25	1.914	1.963	1.938	-1.24	mean RF----	0.0752			
					2nd std	0.3742	N/A	4.8	-2.90





951 Old Rand Road # 106

Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-563  
Project Manager: Steve Flaherty  
Received: 08/12/2013  
Reported: 8/20/2013

Sample ID: Front Half DI Water Blank  
Lab Sample #: 11254

Date Sampled: 08/09/2013

Field #: 52527

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: 5F Filter Blank  
Lab Sample #: 11255

Date Sampled: 08/09/2013

Field #: 52680

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Particulate	USEPA Method 5F	Joel Ruggaber	08/19/2013	3.20	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	08/19/2013	886.1	ug	J

Sample ID: 5F Filter Run 5F-1  
Lab Sample #: 11256

Date Sampled: 08/09/2013

Field #: 52695

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Particulate	USEPA Method 5F	Joel Ruggaber	08/19/2013	156.70	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	08/19/2013	7337.8	ug	

Sample ID: 5F Filter Run 5F-2  
Lab Sample #: 11257

Date Sampled: 08/09/2013

Field #: 52684

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Particulate	USEPA Method 5F	Joel Ruggaber	08/19/2013	58.10	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	08/19/2013	3625.3	ug	J



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
FCCU 500

Lab Project #: 08-563  
Project Manager: Steve Flaherty  
Received: 08/12/2013  
Reported: 8/20/2013

Sample ID: 5F Filter Run 5F-3  
Lab Sample #: 11258

Date Sampled: 08/09/2013  
Field #: 52685

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	08/19/2013	71.40	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	08/19/2013	3017.3	ug	J

Sample ID: Front Half Probe Wash Run 5F-1  
Lab Sample #: 11259

Date Sampled: 08/09/2013  
Field #: 52529

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: Front Half Probe Wash Run 5F-2  
Lab Sample #: 11260

Date Sampled: 08/09/2013  
Field #: 52530

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: Front Half Probe Wash Run 5F-3  
Lab Sample #: 11261

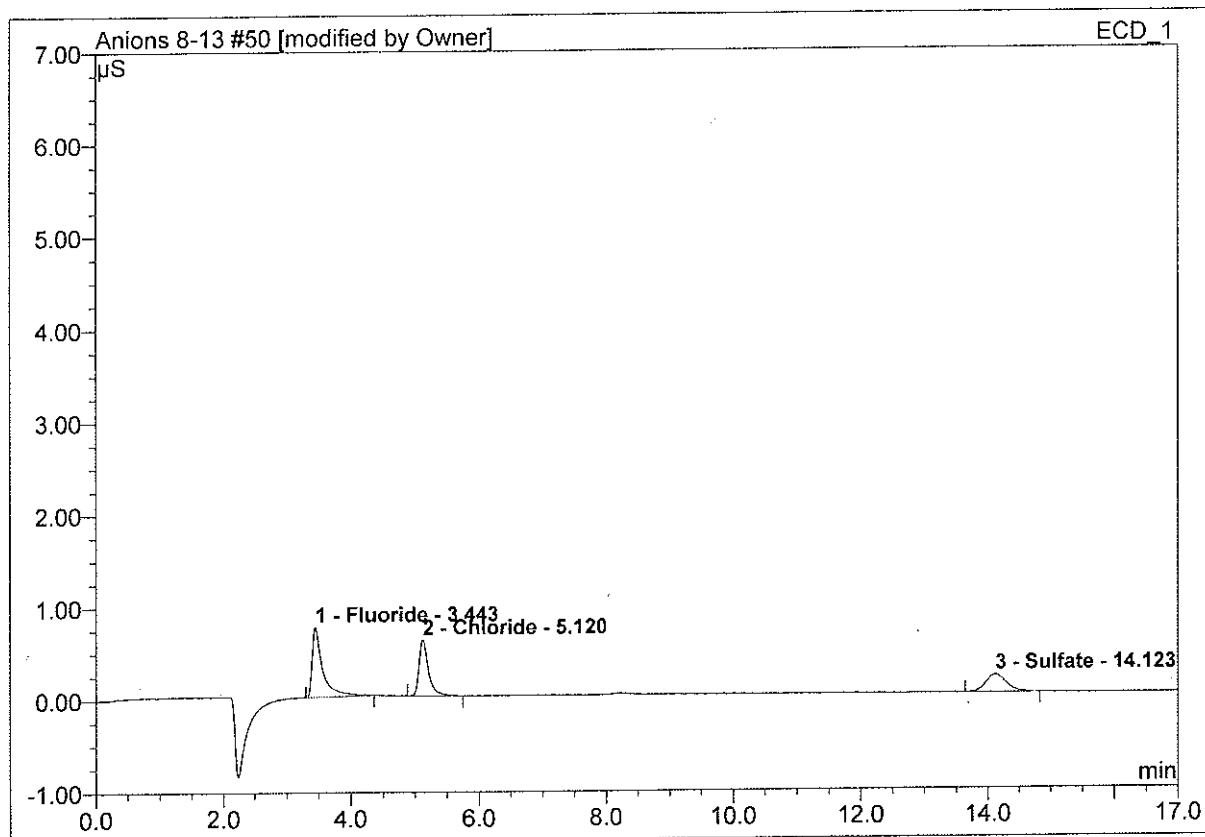
Date Sampled: 08/09/2013  
Field #: 52531

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Notes: UA - Not a NELAC accredited analyte under this method.  
NA - Sample not tested for this analyte.  
D - Value calculated from dilution.  
J - Value less than the low standard but above the Limit of Detection (LOD).  
L - Sample leaked before receipt.  
H - Value greater than the high standard.

**50 1.0 ppm F, Cl, SO4 7-15-13 pre**

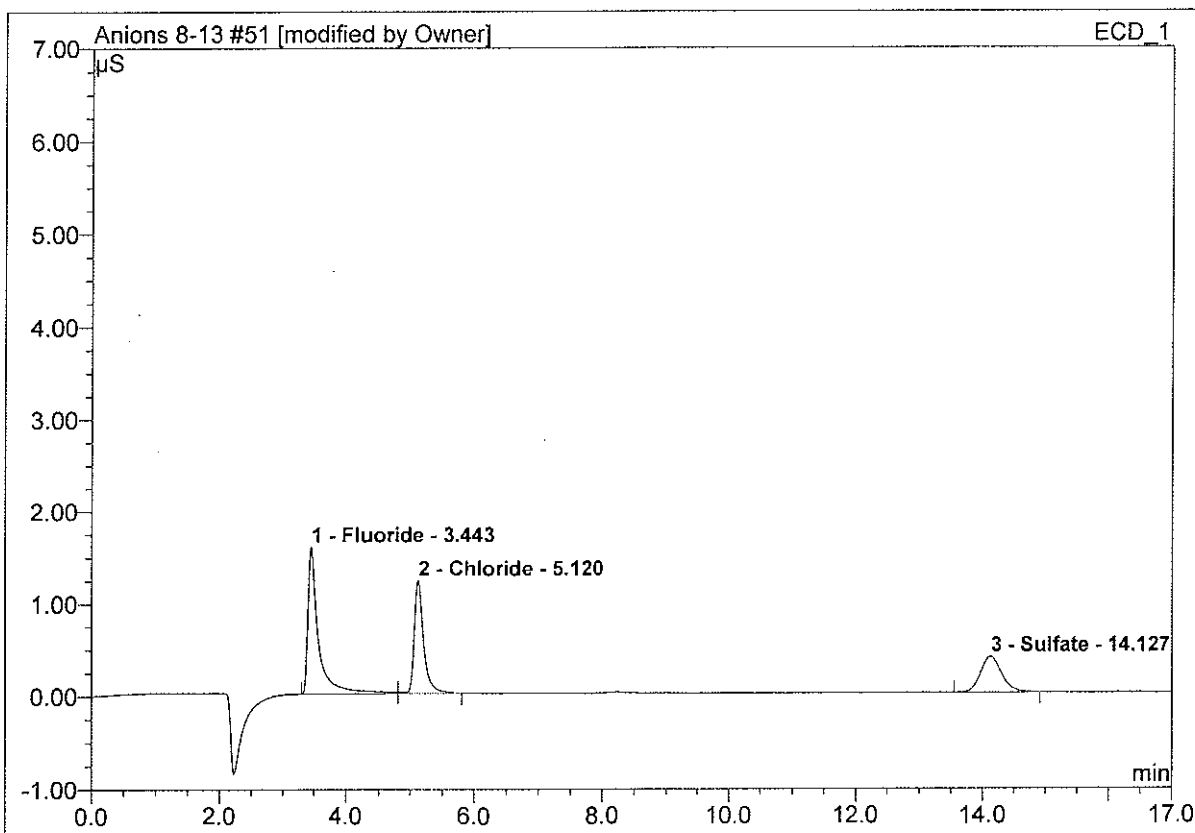
Client	BP	Injection Volume:	20.0
Vial Number:	156	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 14:11	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height $\mu\text{S}$	Area $\mu\text{S}\cdot\text{min}$
1	3.44	Fluoride	0.757	0.1443
2	5.12	Chloride	0.606	0.1035
3	14.12	Sulfate	0.190	0.0722

**51 2.0 ppm F, Cl, SO4 7-15-13 pre**

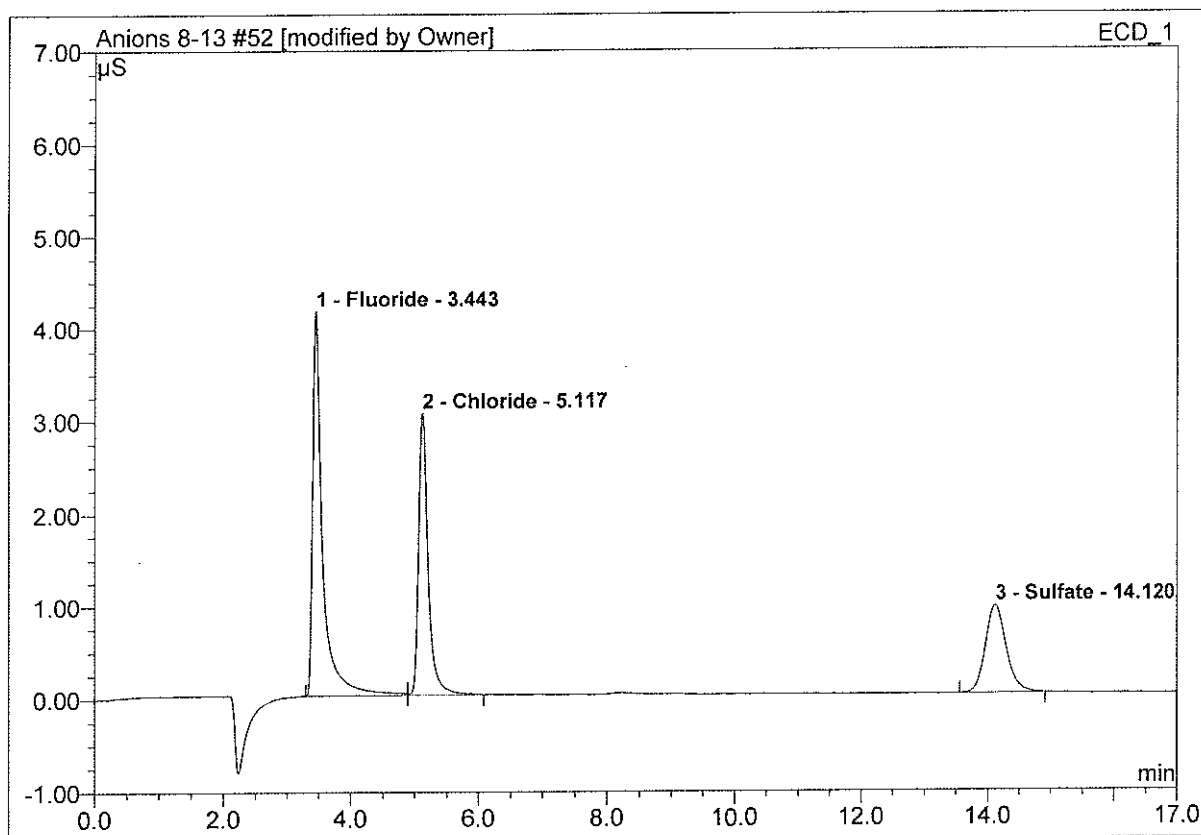
Client	BP	Injection Volume:	20.0
Vial Number:	156	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 14:29	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height $\mu\text{S}$	Area $\mu\text{S}\cdot\text{min}$
1	3.44	Fluoride	1.584	0.3039
2	5.12	Chloride	1.218	0.2086
3	14.13	Sulfate	0.384	0.1468

**52 5.0 ppm F, Cl, SO4 7-15-13 pre**

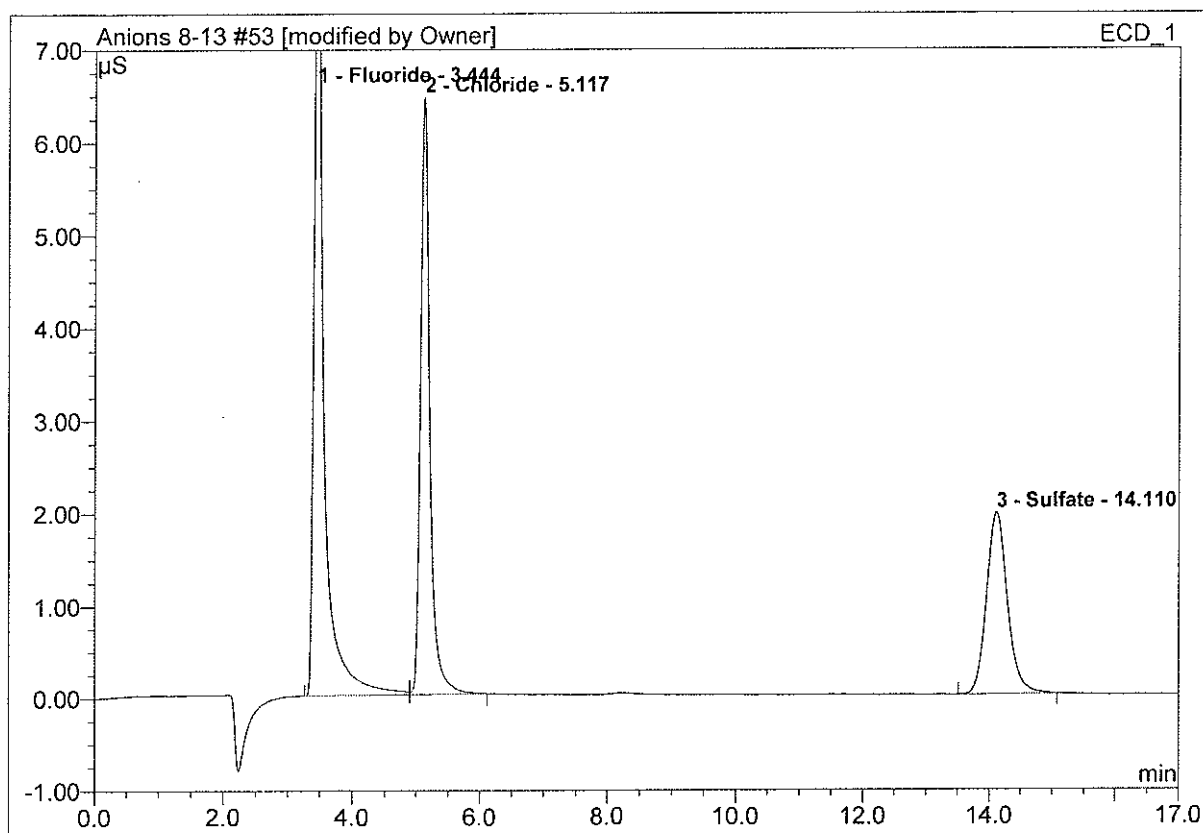
Client	BP	Injection Volume:	20.0
Vial Number:	156	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 14:47	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.44	Fluoride	4.150	0.7523
2	5.12	Chloride	3.034	0.5179
3	14.12	Sulfate	0.944	0.3605

**53 10.0 ppm F, Cl, SO4 7-15-13 pre**

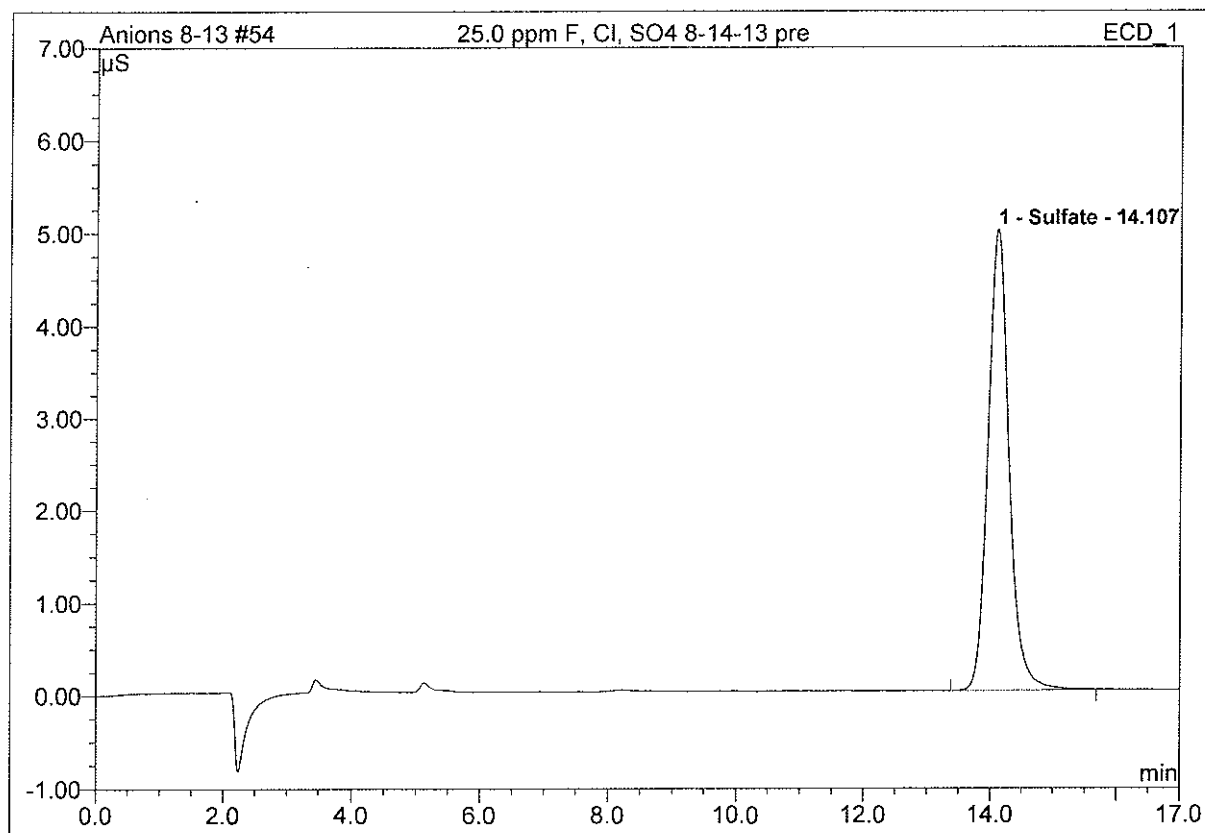
Client	BP	Injection Volume:	20.0
Vial Number:	157	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 15:05	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.44	Fluoride	9.238	1.5801
2	5.12	Chloride	6.447	1.0798
3	14.11	Sulfate	1.963	0.7514

**54 25.0 ppm F, Cl, SO4 8-14-13 pre**

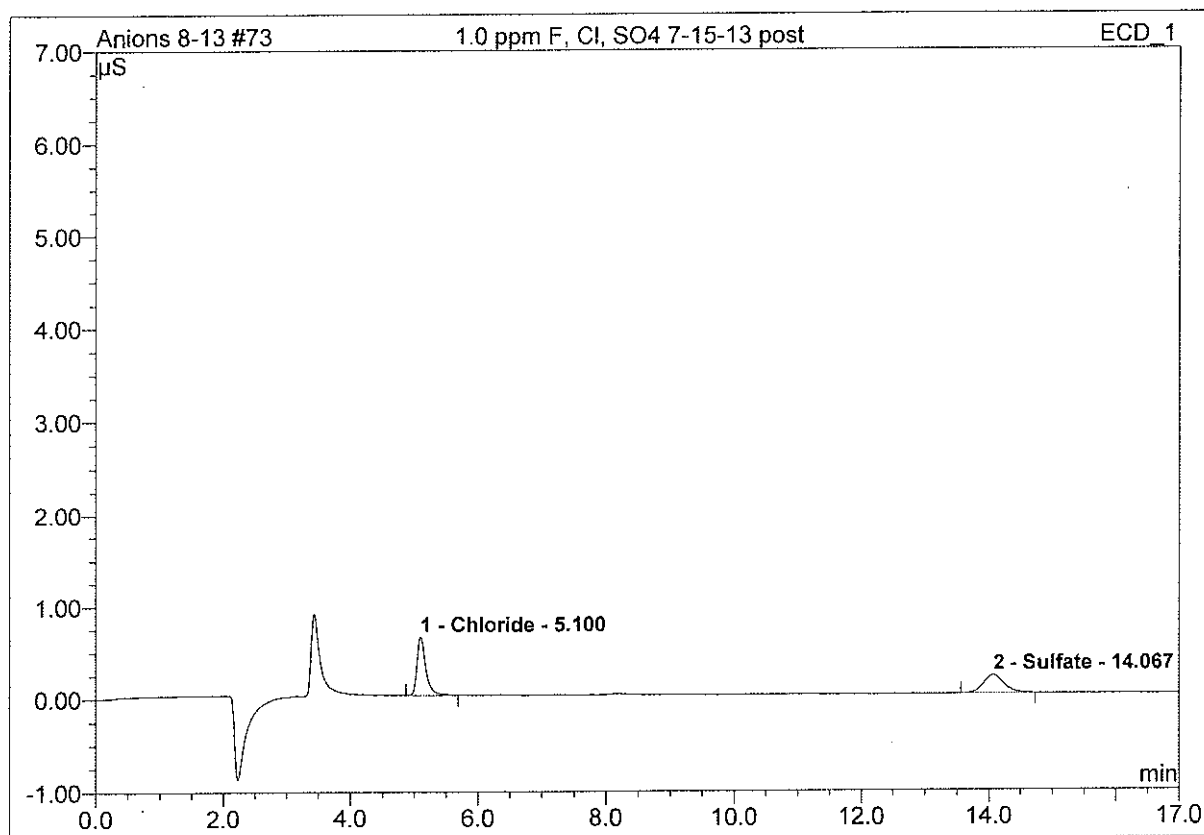
Client	BP	Injection Volume:	20.0
Vial Number:	158	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 15:23	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
1	14.11	Sulfate	4.982	1.9143

**73 1.0 ppm F, Cl, SO4 7-15-13 post**

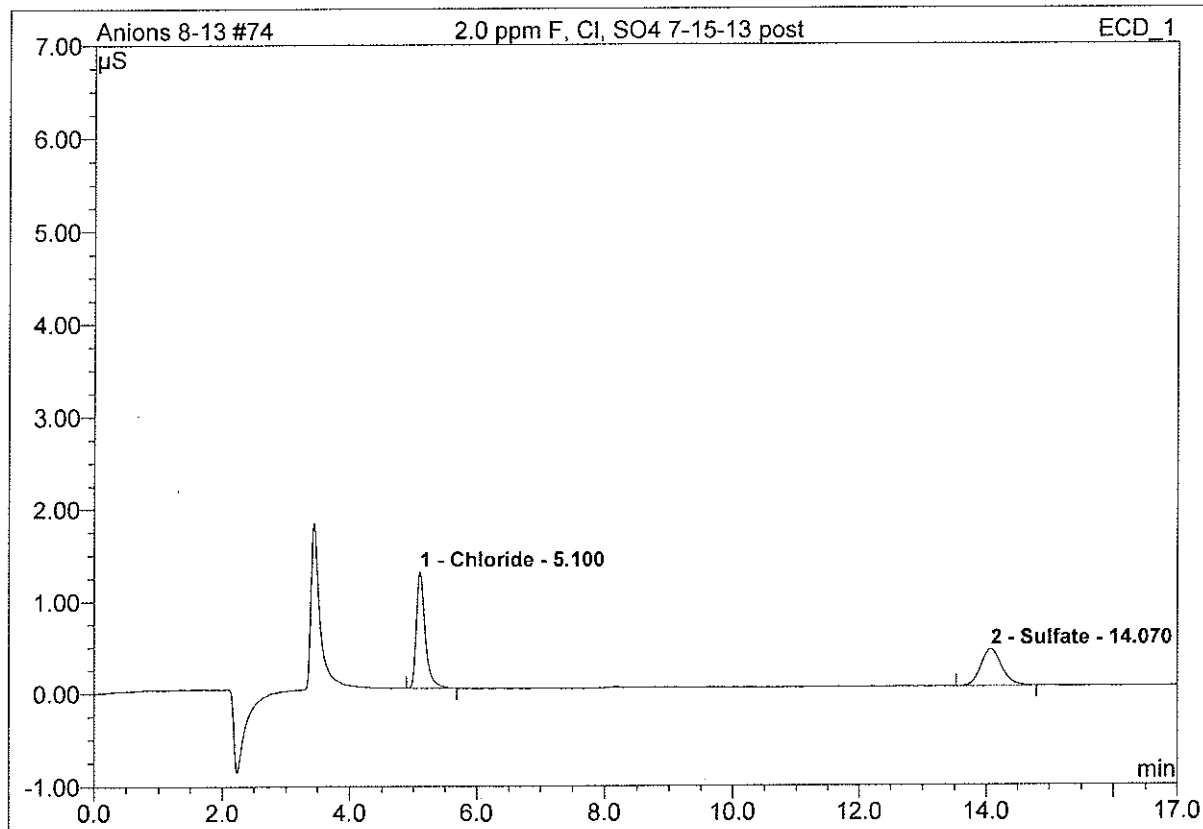
Client	BP	Injection Volume:	20.0
Vial Number:	177	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 11:28	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.10	Chloride	0.630	0.1043
2	14.07	Sulfate	0.195	0.0740

**74 2.0 ppm F, Cl, SO4 7-15-13 post**

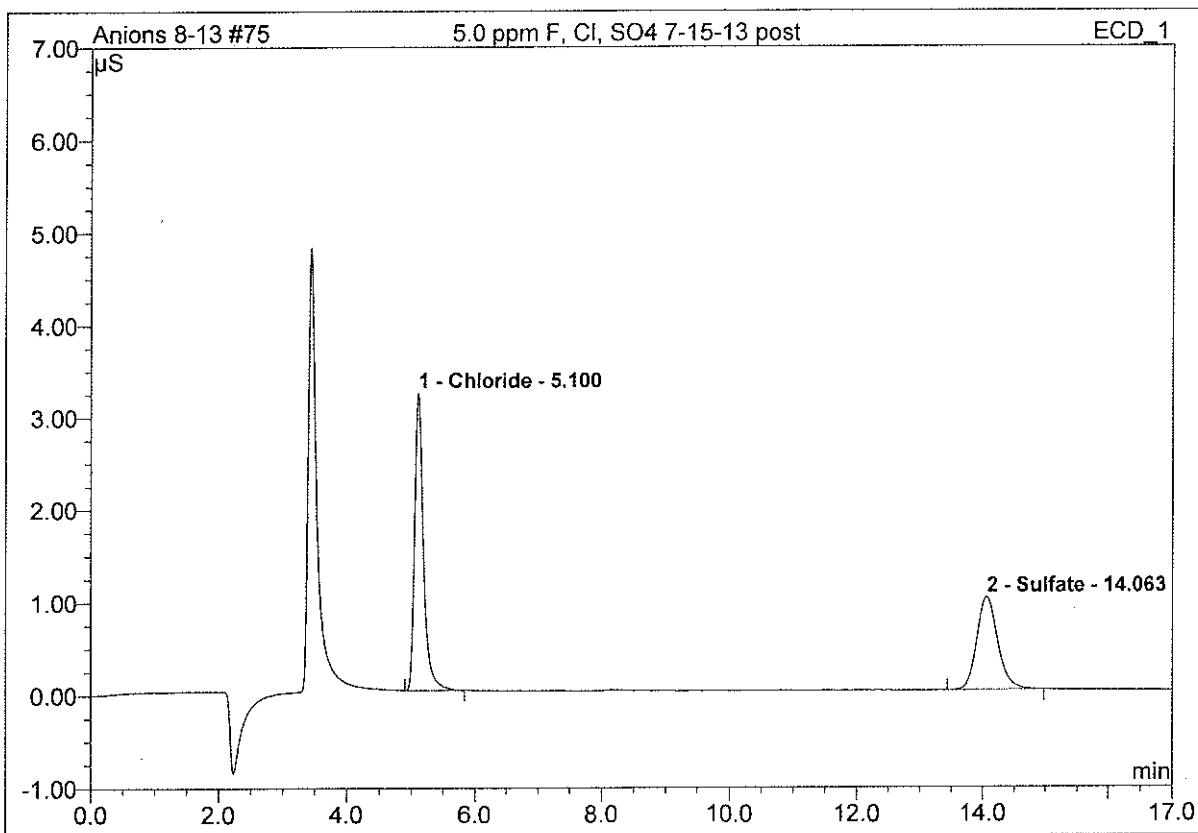
Client	BP	Injection Volume:	20.0
Vial Number:	178	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 11:46	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.10	Chloride	1.260	0.2082
2	14.07	Sulfate	0.398	0.1520

**75 5.0 ppm F, Cl, SO4 7-15-13 post**

Client	BP	Injection Volume:	20.0
Vial Number:	179	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 12:05	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000

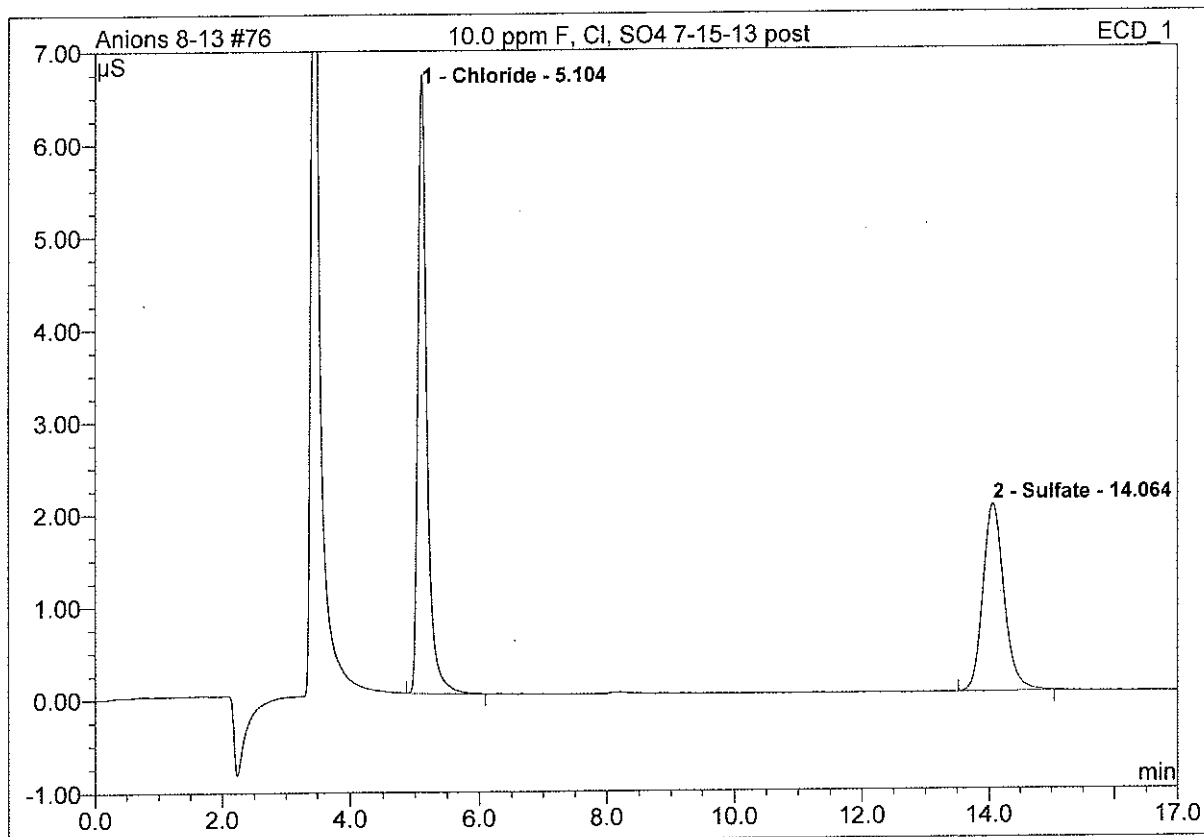


No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	5.10	Chloride	3.212	0.5280
2	14.06	Sulfate	0.998	0.3805

**76 10.0 ppm F, Cl, SO4 7-15-13 post**

Client **BP**  
Vial Number: **180**  
Sample Type: **standard**  
Control Program: **Anions 1000**  
Quantif. Method: **ICS\_1000\_Anions**  
Recording Time: **8/15/2013 12:23**  
Run Time (min): **12.00**

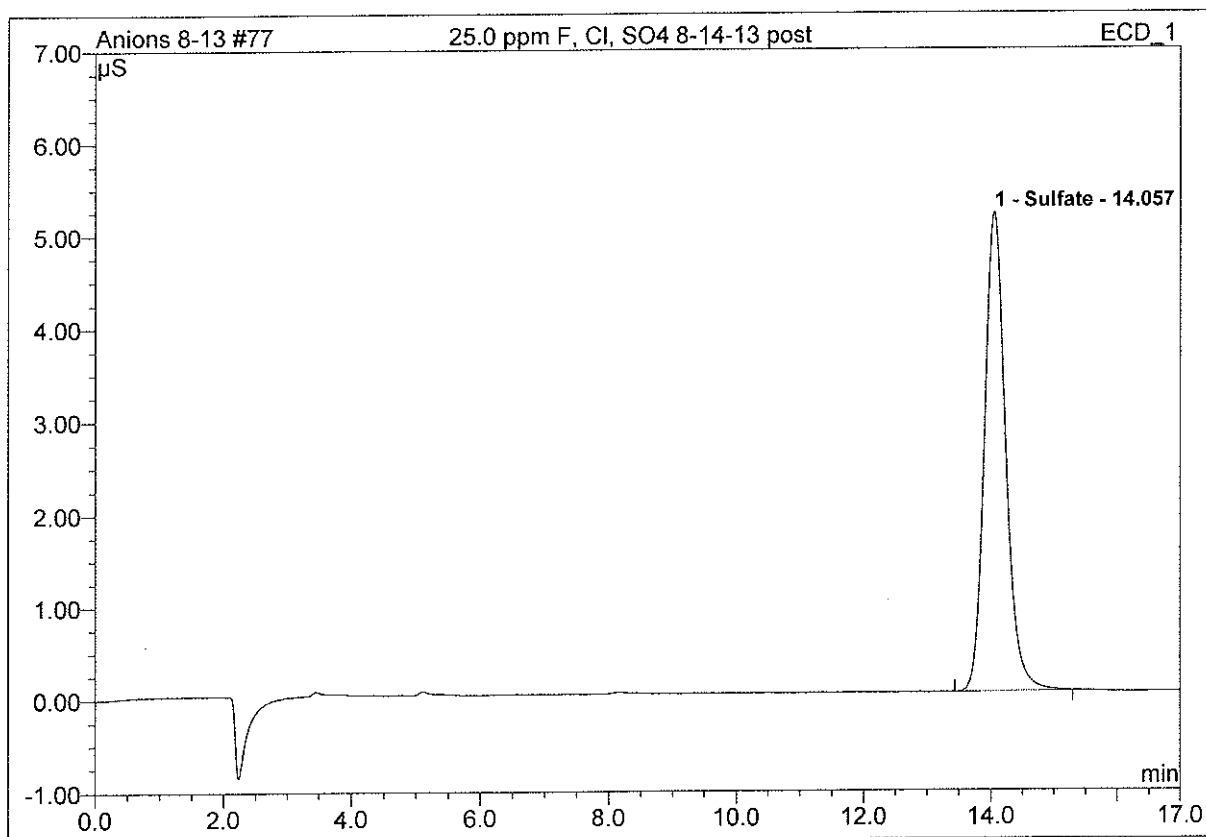
Injection Volume: **20.0**  
Channel: **ECD\_1**  
Wavelength: **n.a.**  
Bandwidth: **n.a.**  
Dilution Factor: **1.0000**  
Sample Weight: **1.0000**  
Sample Amount: **1.0000**



No.	Ret. Time min	Peak Name	Height $\mu\text{S}$	Area $\mu\text{S}\cdot\text{min}$
1	5.10	Chloride	6.682	1.0917
2	14.06	Sulfate	2.023	0.7719

**77 25.0 ppm F, Cl, SO4 8-14-13 post**

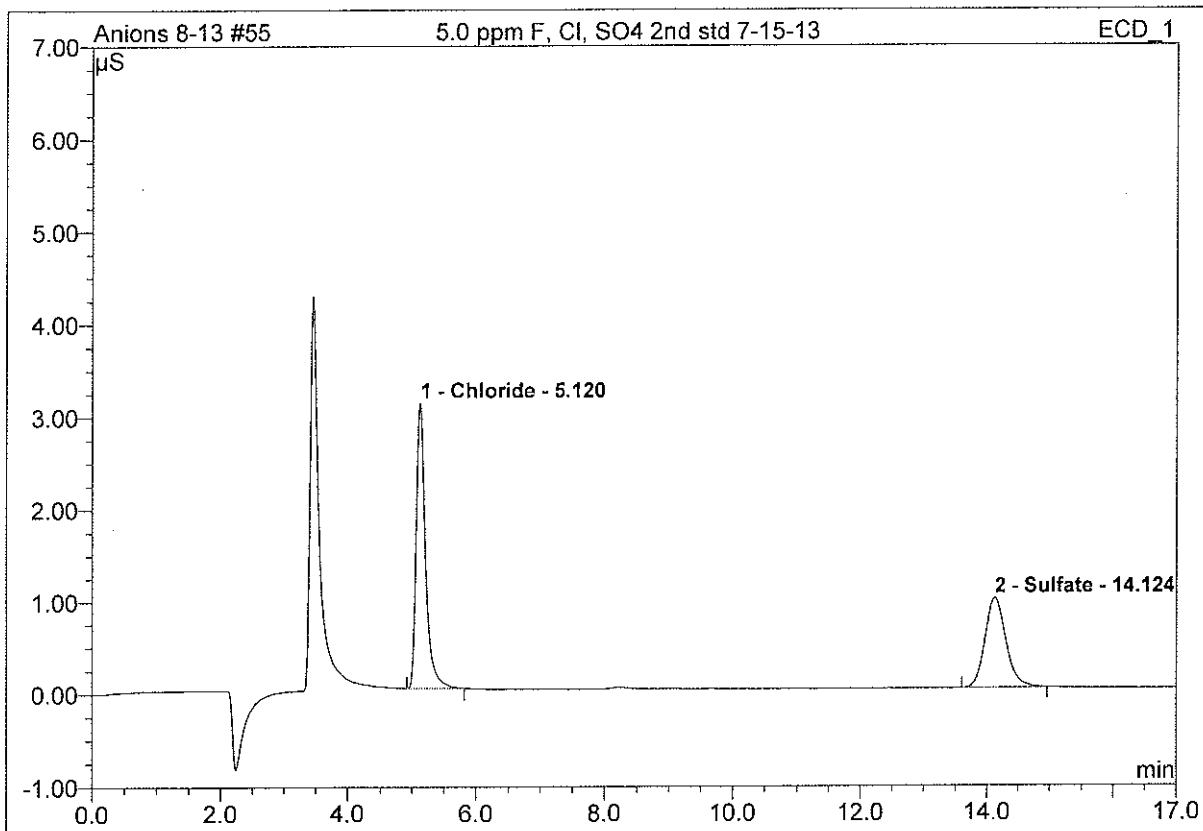
Client	BP	Injection Volume:	20.0
Vial Number:	181	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 12:41	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	14.06	Sulfate	5.171	1.9625

**55 5.0 ppm F, Cl, SO4 2nd std 7-15-13**

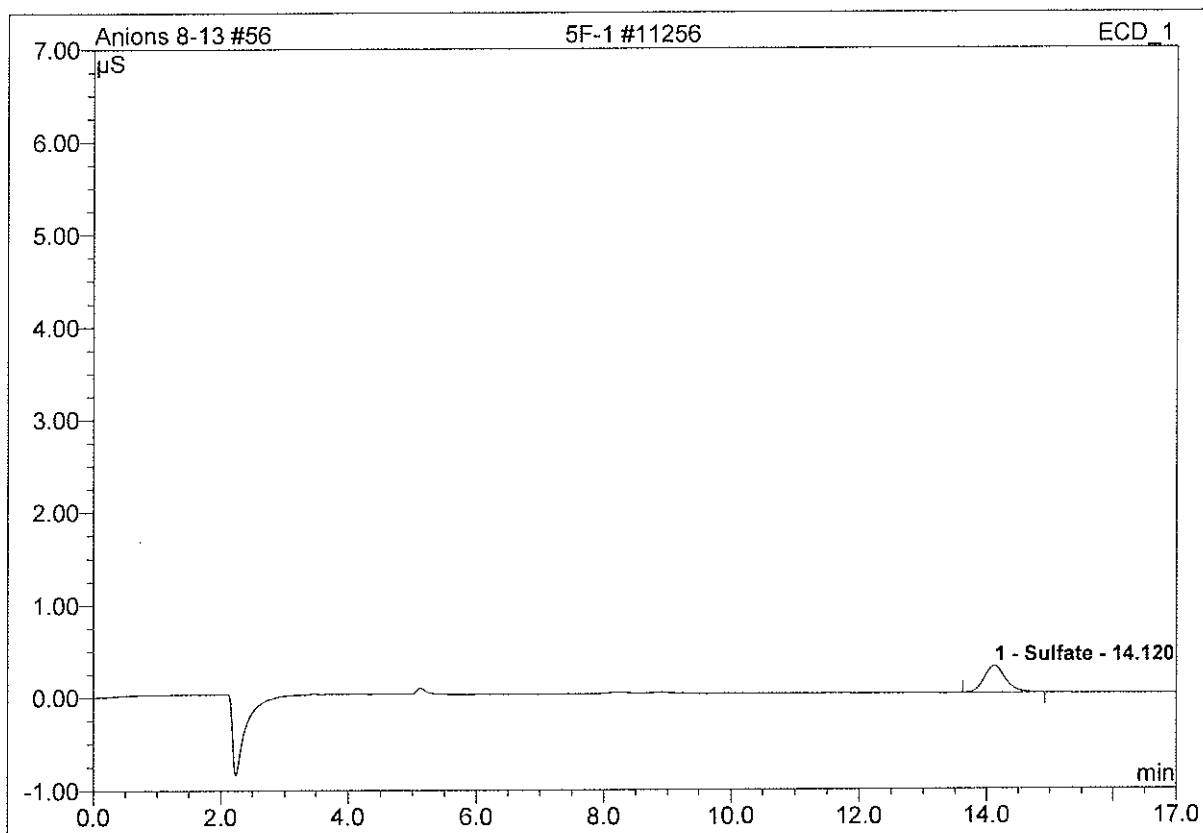
Client	BP	Injection Volume:	20.0
Vial Number:	159	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 15:42	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
1	5.12	Chloride	3.090	0.5172
2	14.12	Sulfate	0.973	0.3742

**56 5F-1 #11256**

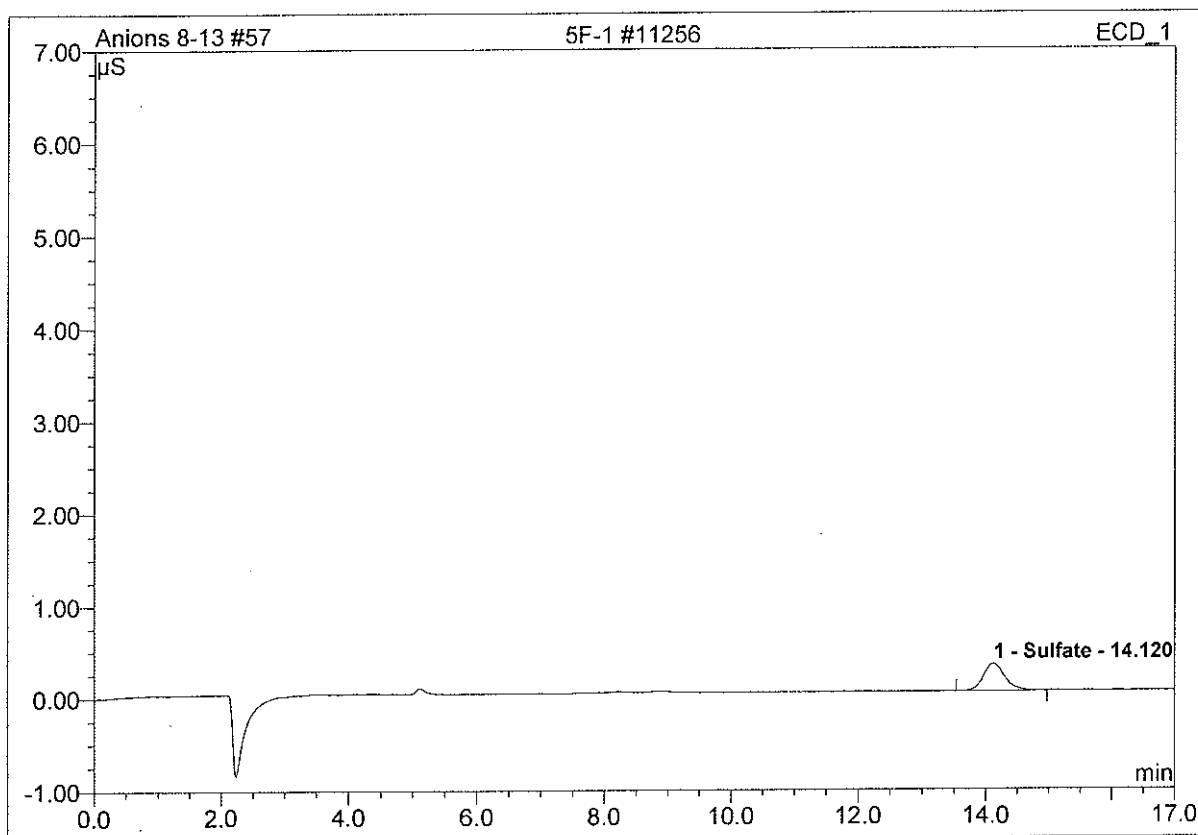
Client	BP	Injection Volume:	20.0
Vial Number:	160	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 16:00	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	14.12	Sulfate	0.291	0.1122

**57 5F-1 #11256**

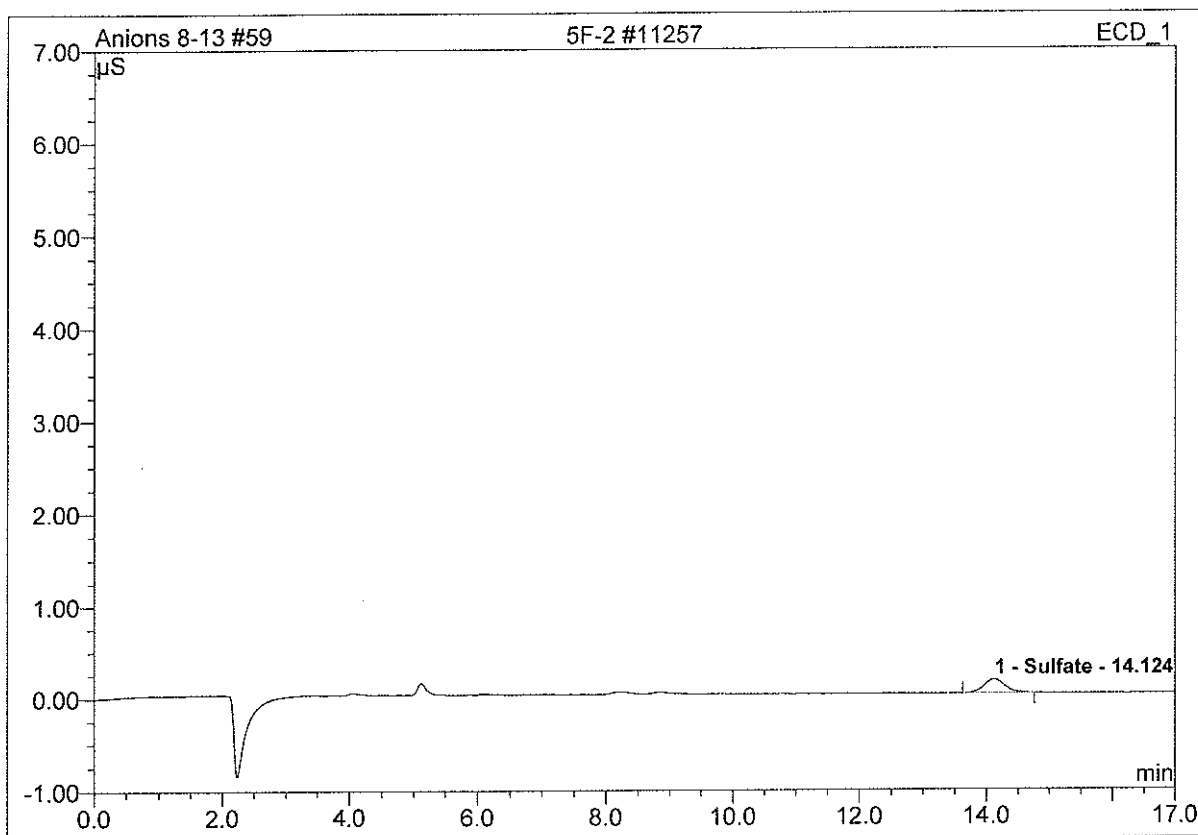
Client	BP	Injection Volume:	20.0
Vial Number:	161	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 16:18	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	14.12	Sulfate	0.294	0.1147

**59 5F-2 #11257**

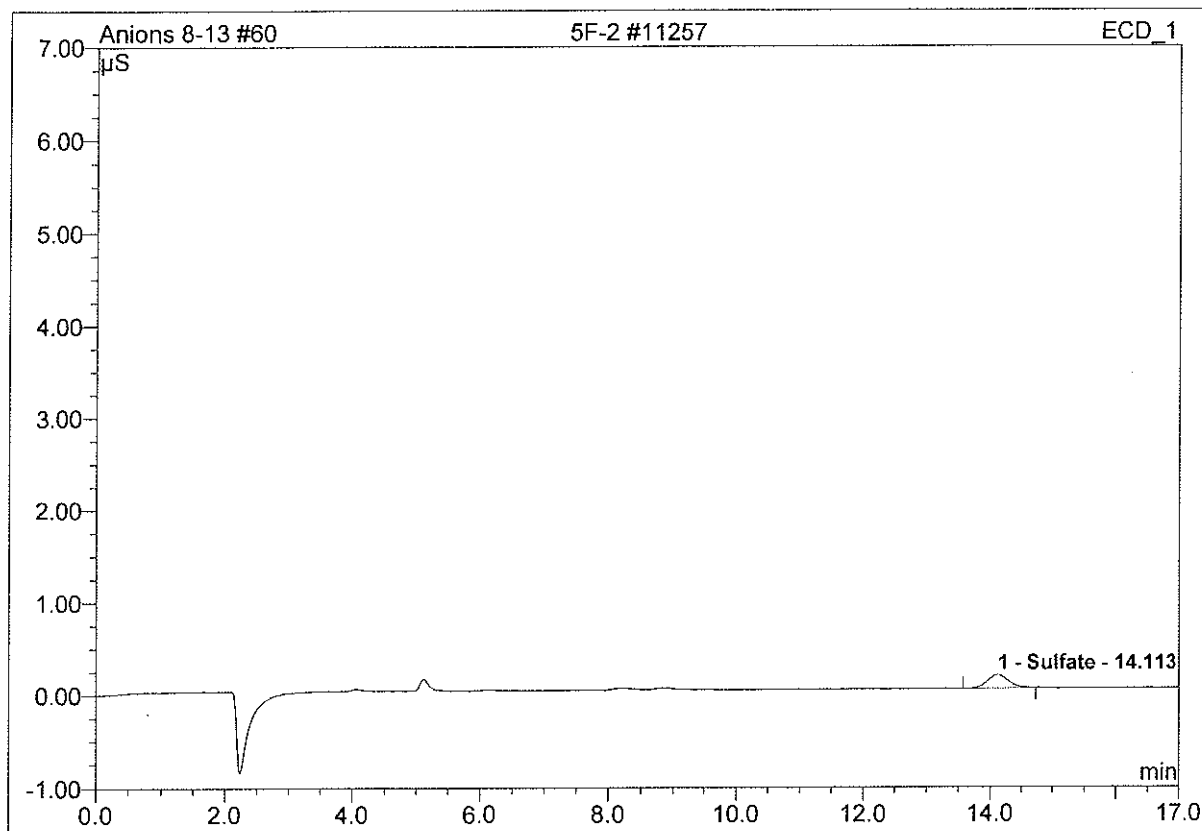
Client	BP	Injection Volume:	20.0
Vial Number:	163	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 16:54	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	14.12	Sulfate	0.147	0.0560

**60 5F-2 #11257**

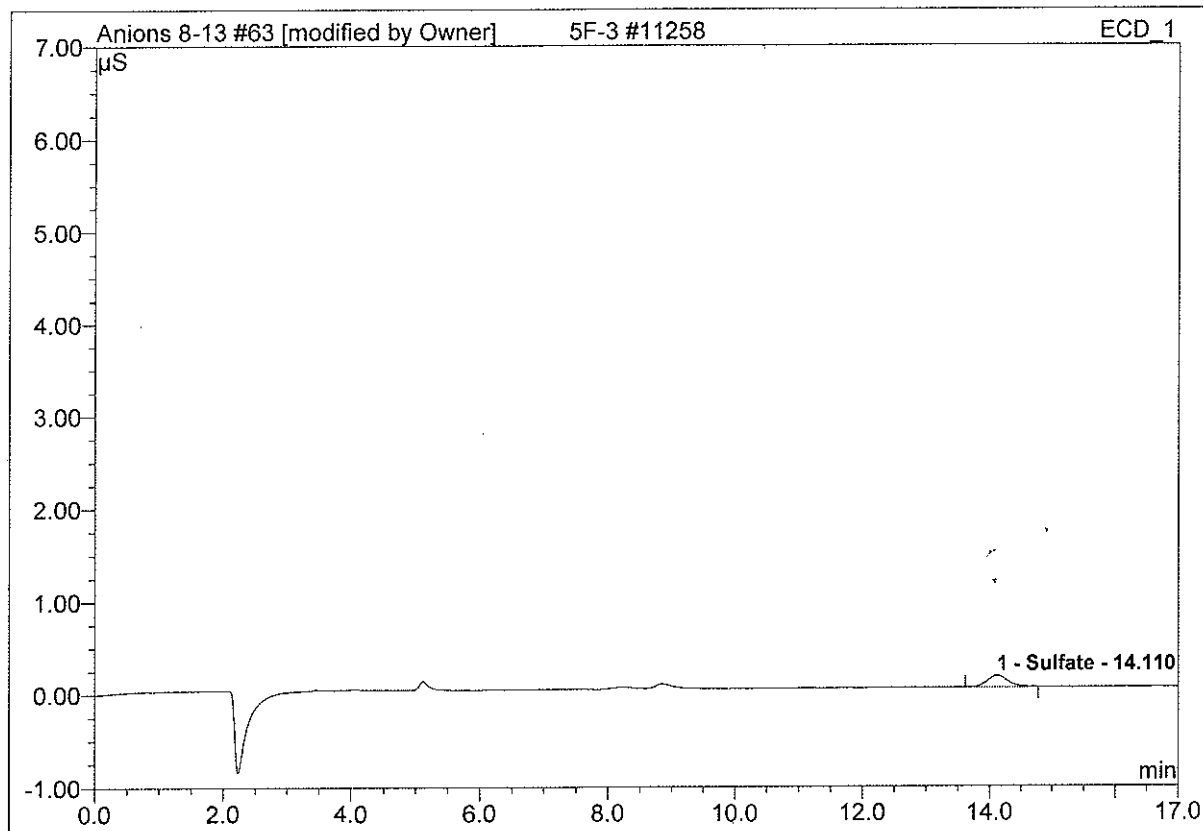
Client	BP	Injection Volume:	20.0
Vial Number:	164	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 17:12	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	14.11	Sulfate	0.147	0.0561

**63 5F-3 #11258**

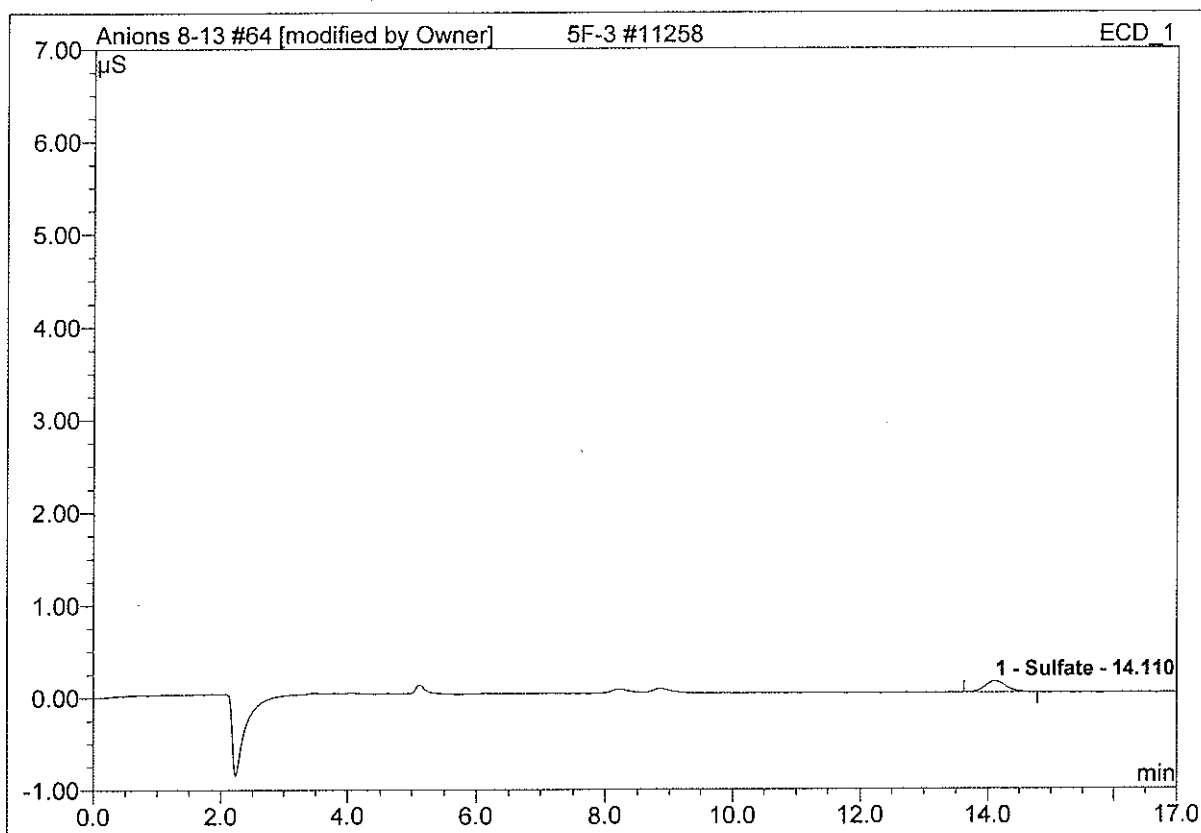
Client	BP	Injection Volume:	20.0
Vial Number:	167	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 18:07	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	14.11	Sulfate	0.123	0.0465

**64 5F-3 #11258**

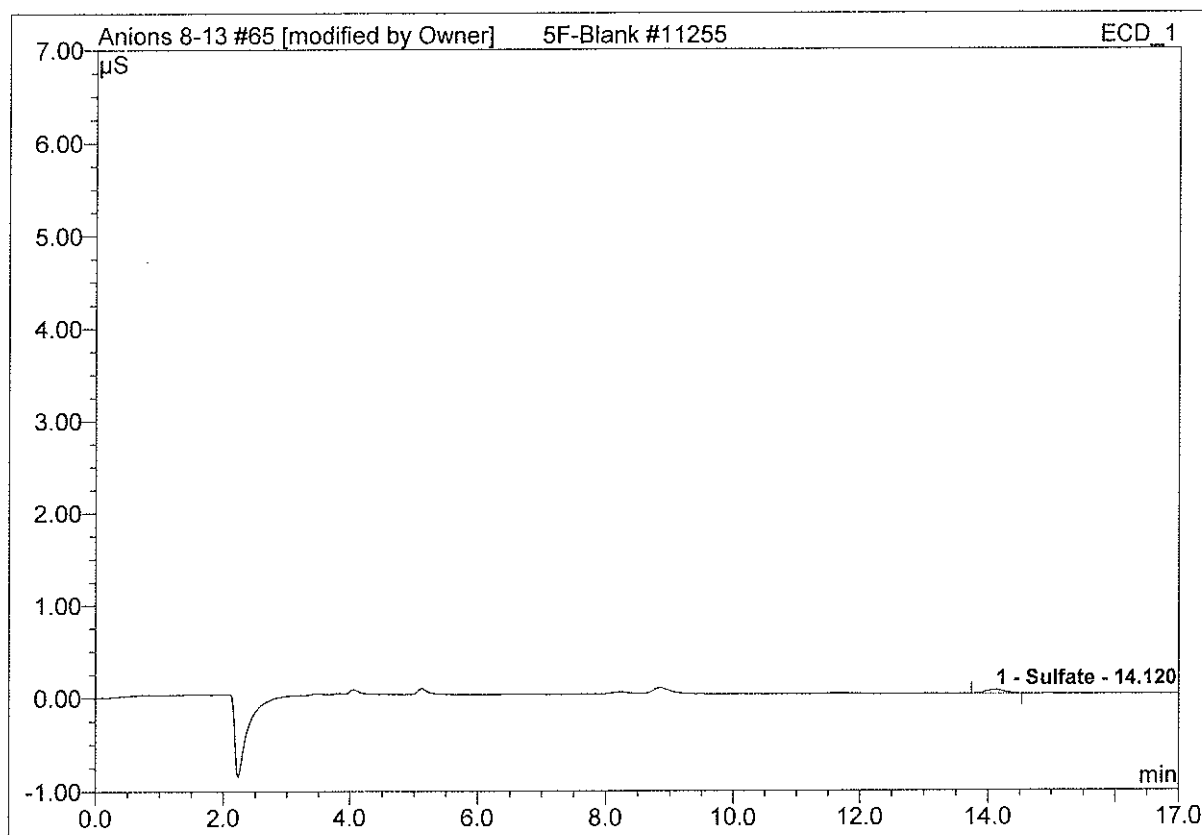
Client	BP	Injection Volume:	20.0
Vial Number:	168	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 18:25	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	14.11	Sulfate	0.121	0.0468

**65 5F-Blank #11255**

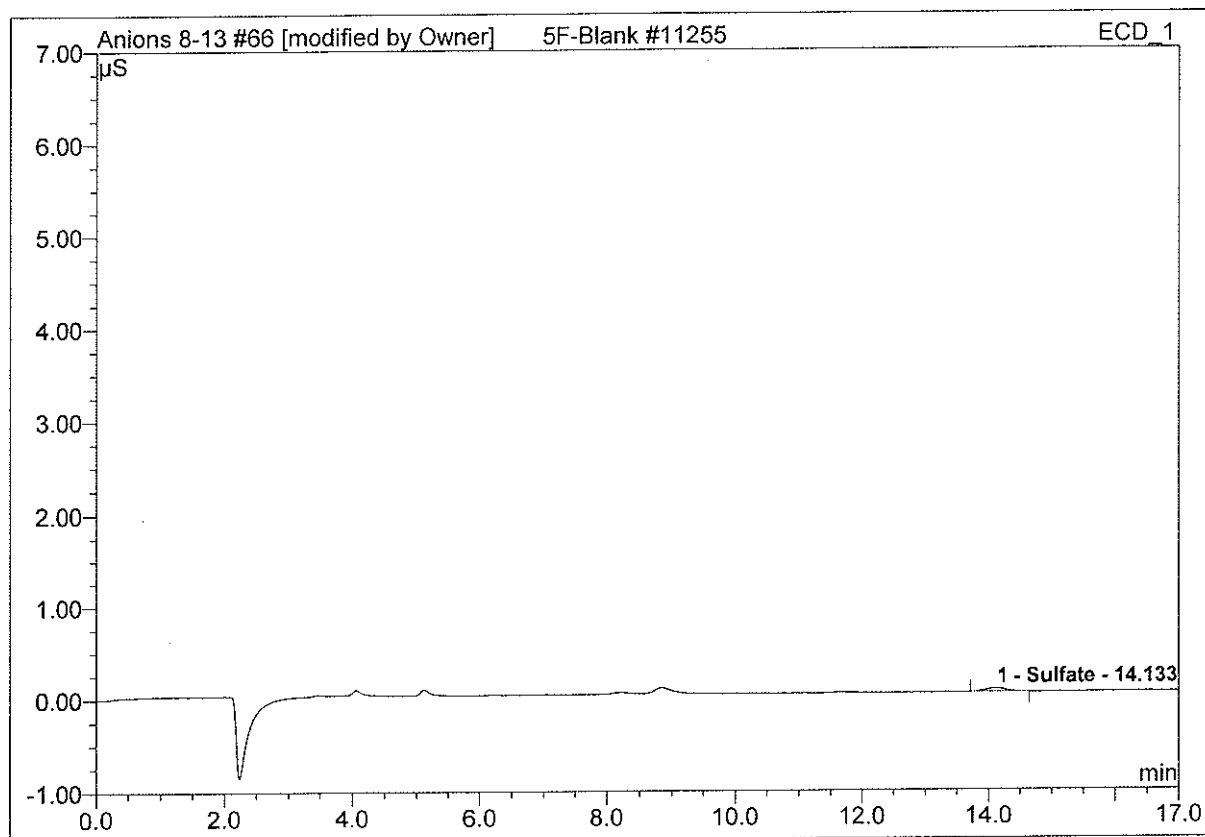
Client	BP	Injection Volume:	20.0
Vial Number:	169	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 18:43	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
1	14.12	Sulfate	0.039	0.0133

**66 5F-Blank #11255**

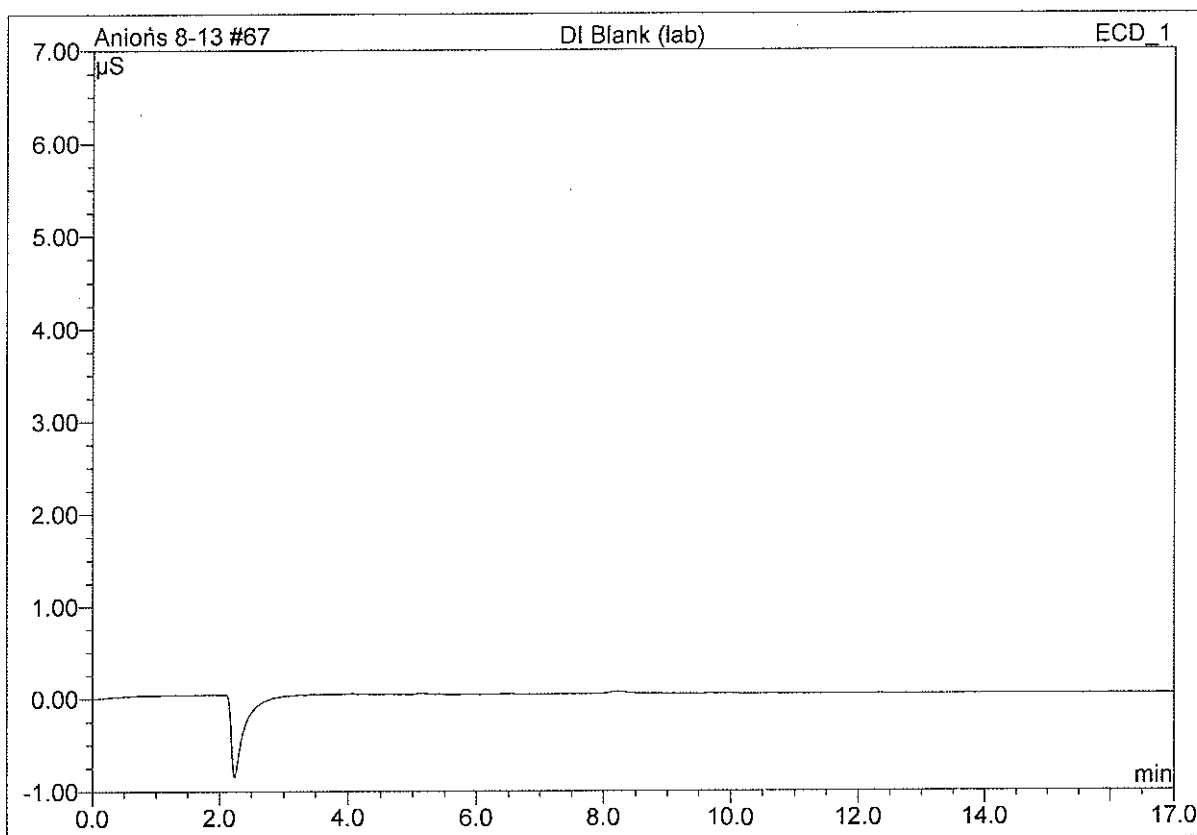
Client	BP	Injection Volume:	20.0
Vial Number:	170	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 19:01	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	14.13	Sulfate	0.037	0.0141

**67 DI Blank (lab)**

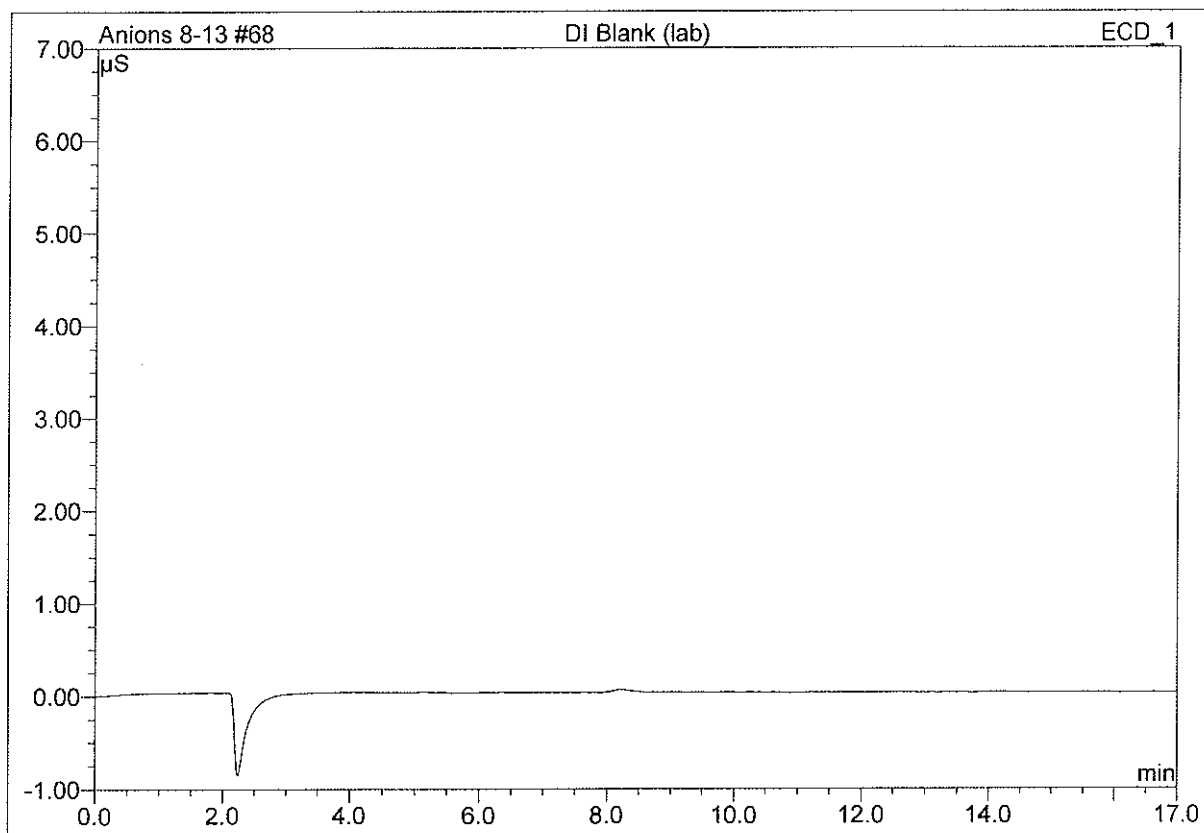
Client	BP	Injection Volume:	20.0
Vial Number:	171	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 19:19	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
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**68 DI Blank (lab)**

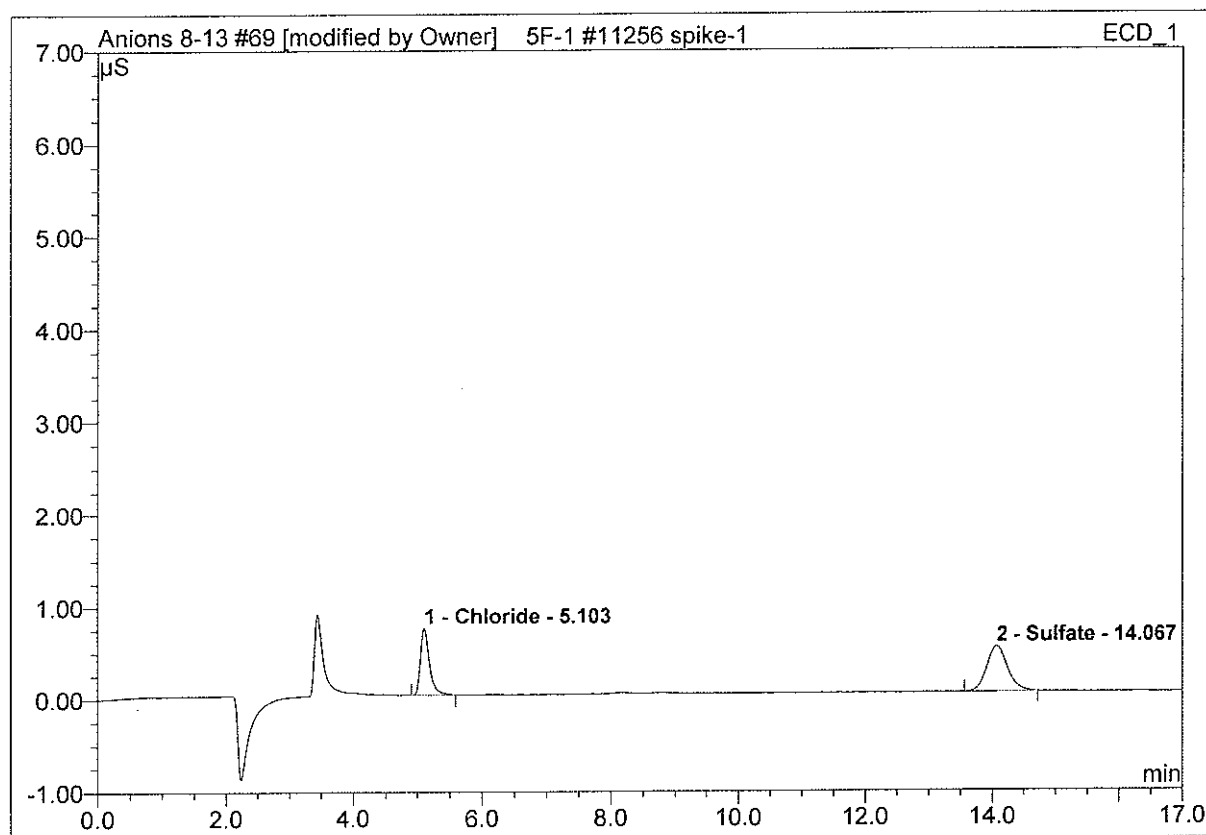
Client	BP	Injection Volume:	20.0
Vial Number:	172	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/14/2013 19:37	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
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**69 5F-1 #11256 spike-1**

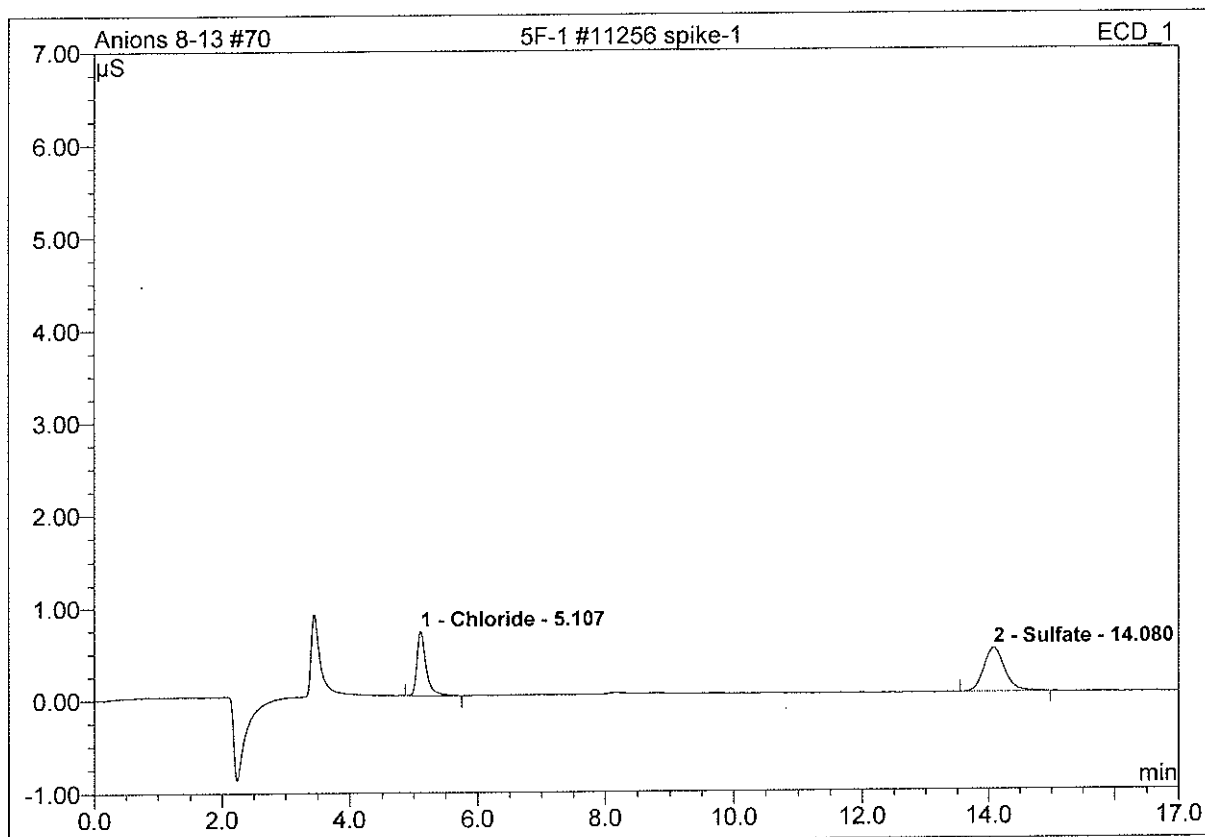
Client	BP	Injection Volume:	20.0
Vial Number:	173	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 10:11	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.10	Chloride	0.720	0.1183
2	14.07	Sulfate	0.488	0.1849

**70 5F-1 #11256 spike-1**

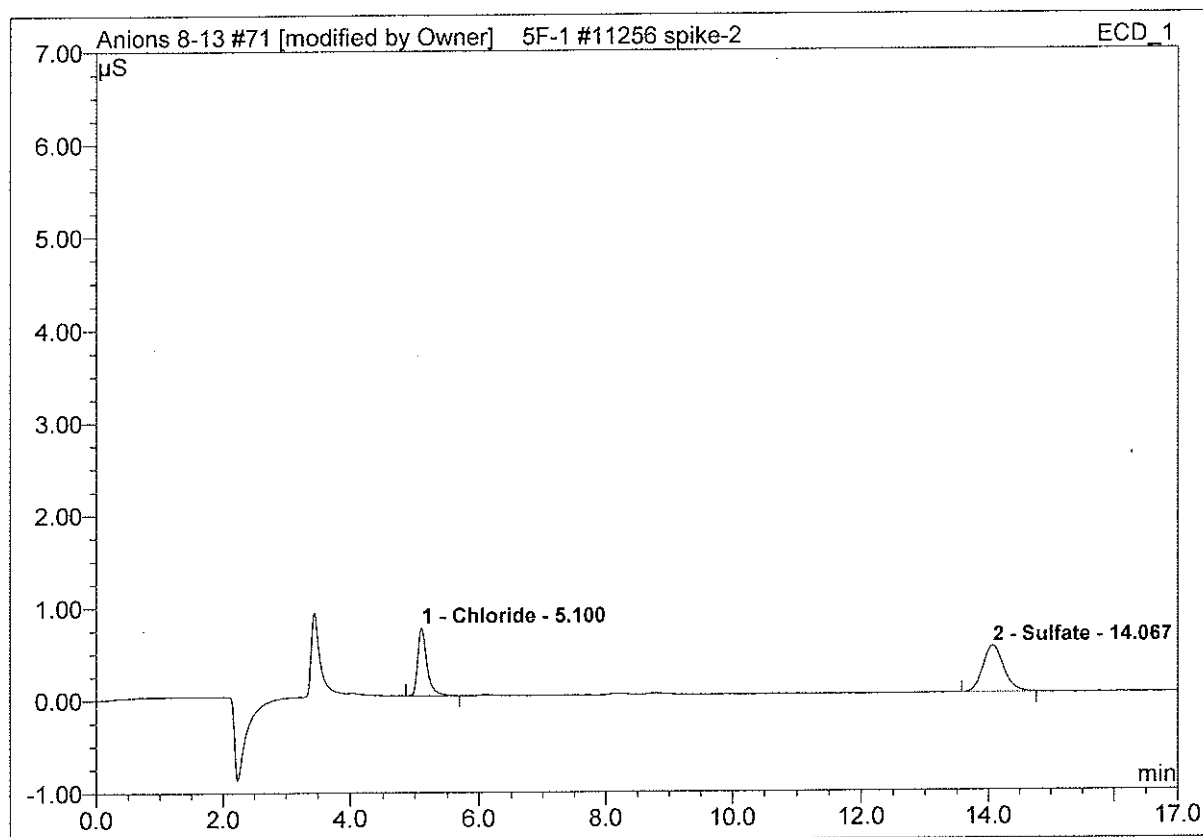
Client	BP	Injection Volume:	20.0
Vial Number:	174	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 10:29	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.11	Chloride	0.692	0.1160
2	14.08	Sulfate	0.471	0.1812

**71 5F-1 #11256 spike-2**

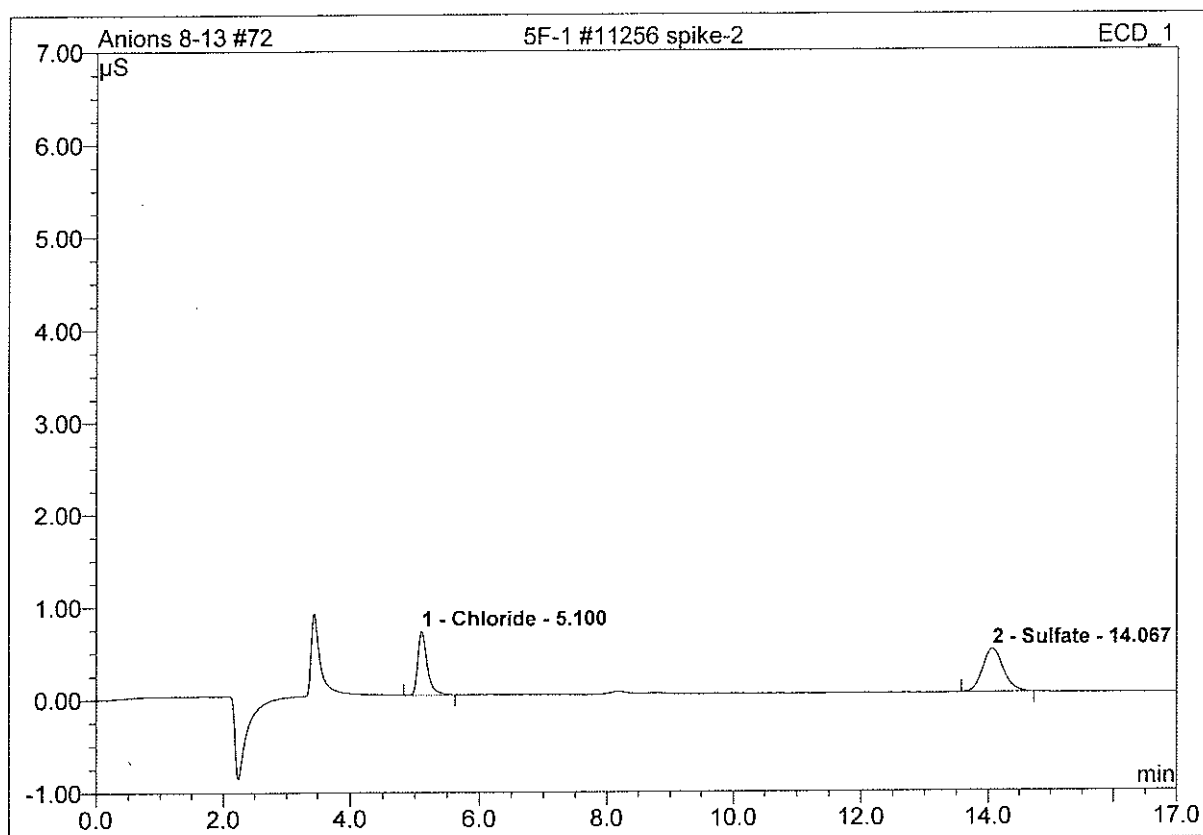
Client	BP	Injection Volume:	20.0
Vial Number:	175	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 10:47	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.10	Chloride	0.733	0.1214
2	14.07	Sulfate	0.499	0.1883

**72 5F-1 #11256 spike-2**

Client	BP	Injection Volume:	20.0
Vial Number:	176	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	8/15/2013 11:05	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	5.10	Chloride	0.688	0.1143
2	14.07	Sulfate	0.463	0.1738

USEPA METHOD 5F TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 8/9/13

Lab Project #: 08-563

Spreadsheet Template ID: USEPA-M5F-Partic-Template-61T-REV3

Analyst: J. Ruggaber

EluentSodium Carbonate ( $\text{Na}_2\text{CO}_3$ ) manufacturer and lot: Fisher, Lot 095351

Batch Number	Amount weighed/2L	Date/Time Prepared
1	1.6965 g	8/14/13, 10:00
2	g	
3	g	

Sodium Bicarbonate ( $\text{NaHCO}_3$ ) manufacturer and lot: Fisher, Lot 110567

Batch Number	Amount weighed/2L	Date/Time Prepared
1	0.1686 g	8/14/13, 10:00
2	g	
3	g	

Reagents

Phenolphthalein Solution: WL-LOG#4-Log-037A page 46

Ammonium Hydroxide: 0.0992 N, lot SHBC0698V, Fluka



# USEPA METHOD 5F TASK SCHEDULE FORM

Document Number: WL-M5FTASK-FORM-026A

Revision Number: 1

Effective Date: 11/15/10

## Standard Identification

1) 1.0 ppm F, Cl, SO<sub>4</sub> 7-15-13

2) 2.0 ppm F, Cl, SO<sub>4</sub> 7-15-13

3) 5.0 ppm F, Cl, SO<sub>4</sub> 7-15-13

4) 10.0 ppm F, Cl, SO<sub>4</sub> 7-15-13

5) 25.0 ppm SO<sub>4</sub> 8-14-13

Secondary standard solution 5.0 ppm F, Cl, SO<sub>4</sub> 7-15-13

DATE/TIME	EQUIPMENT	TASK
N/A	N/A	If not already performed in the field, remove the filter from the filter holder and place into a Petri dish.
8/13/13	N/A	Cut the filter into small pieces, and transfer to a 250 mL beaker.
8/13/13	N/A	Rinse the Petri dish with water, and transfer the wash to the beaker. Add additional water to approximately 75 mL.
8/13/13, 10:00 – 16:45	N/A	Reflux on a hot plate for 6-8 hours.
8/13/13 – 8/14/13	N/A	Cool the flasks, and transfer contents, including particulate and filter pieces, to a 500 mL (or 1000 mL, if needed) volumetric flask.
8/14/13	N/A	Add the probe wash (with rinse) to the volumetric flask. Dilute to volume with water. Repeat for all samples and blanks.
8/14/13	N/A	After solids settle, volumetrically dilute 5 mL to 50 mL with water. Save for sulfate analysis.
8/12/13 10:29	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs).
8/14/13 10:18	Balance #1	Weigh conditioned beakers and record tares.
8/14/13 – 8/15/13	Oven #1	Evaporate the contents of the volumetric flasks (and rinses) in tared beakers using a 105 °C oven to about 100 mL.
8/15/13	N/A	Remove the beakers from the oven and cool.
8/15/13	N/A	Add approximately 5 drops of phenolphthalein to each beaker. Add concentrated ammonium hydroxide dropwise until the solution turns pink.
8/15/13 – 8/16/13	Oven #1	Return the beakers to the oven and evaporate to dryness.
8/16/13 8:35	Desiccator #1	Place beakers in desiccator (store min. 24 hours)



# USEPA METHOD 5F TASK SCHEDULE FORM

Document Number: WL-M5FTASK-FORM-026A

Revision Number: 1

Effective Date: 11/15/10

8/19/13 9:10	Balance #1	Beaker weighing #1
8/19/13 15:39	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
8/14/13	ICS 1000 Anions	Equilibrate the IC instrument
8/14/13	ICS 1000 Anions	Inject each of the 5 standard solutions once. Plot the standard injection areas against sulfate concentrations to determine an initial calibration curve.
8/14/13	ICS 1000 Anions	Inject secondary standard once. Check that the secondary standard is within 15% of the initial calibration curve.
8/14/13 – 8/15/13	ICS 1000 Anions	Inject each sample solution in duplicate. Check that the sulfate area count for each duplicate injection is within 5% of the mean.
N/A	N/A	If necessary, dilute sample solutions and re-inject.
N/A	N/A	Inject the midpoint standard once after every 20 sample injections. Check that the standard is within 15% of the initial calibration curve.
8/15/13	ICS 1000 Anions	Inject each standard solution once at the end of the run.
8/16/13	ICS 1000 Anions	Determine a final calibration curve.
8/16/13	ICS 1000 Anions	Determine the concentrations of each sample using the final calibration curve.
8/20/13	ICS 1000 Anions	Prepare report
		Report QA review
		Report distribution



951 Old Rand Road, Unit 106  
Wauconda, Illinois 60084



1710 Preston Road, Unit C  
Pasadena, Texas 77503

## SAMPLE RECEIPT CHECKLIST

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 8/9/13

Chain-of-Custody Number(s): W01453

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present	<u>Yes</u>	No
Preservation code noted	<u>Yes</u>	No
Project information clearly identified	<u>Yes</u>	No
Sample information clearly identified	<u>Yes</u>	No
Analysis request clearly identified	<u>Yes</u>	No
Report tier level noted	<u>Yes</u>	No

Sample Containers:

Quantity of samples match number on COC	<u>Yes</u>	No
Container label ID numbers and descriptions match COC	<u>Yes</u>	No
All containers received in good condition	<u>Yes</u>	No
Liquid levels at marked heights on containers	<u>Yes</u>	No
All container labels are legible	<u>Yes</u>	No
All sample IDs are unique	<u>Yes</u>	No
Samples received in correct type of container	<u>Yes</u>	No
Samples received within the required holding time	<u>Yes</u>	No
Samples received under the required preservation code	<u>Yes</u>	No

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met.

Samples Received by: Eric Vogt Eric Vogt  
Printed Name Signature

Date and Time Received: 8/12/13 9:00 a.m.



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01453

Lab Project No. (Lab use only) 08-561/6244	Client Name BP	Client Location Whiting, TN	ARI Project Manager S. Flaherty		Subcontracted Laboratory (if applicable)	
ARI Proposal Number 08-561	ARI Test Plan Number	Laboratory (Wauconda or Pasadena) Wauconda	Engineering or Compliance Test Samples Compliance			
ARI Sampler Initials BAAH, TM, DO	Sample Date 8-7-13	Time of Collection 8-7-13	Sample Identification Imp Contents Field Blad	Number of Containers 1	Container Type (Petri, Bottle, Bag, Tube)	Preservation Code 1
52524	8-7-13		Organic Resins Field Blad	1		
52525			CPW Filter Field Blad	1		
52526	8-7-13		Front V2 DI H2O Field Blad	1		
52527			5F Filter Blank	1		
52680			5F Filter SF-1	1		
52684			5F Filter SF-2	1		
52685			5F Filter SF-3	1		
52529			Front V2 PW SF-1	1		
52530			Front V2 PW SF-2	1		
52531			Front V2 PW SF-3	1		
Special Instructions:			(1) Relinquished By 8-9-13 1930 ARI	(2) Relinquished By Date / Time Company	(3) Relinquished By Date / Time Company	SHIPMENT: Hand Carry FedEx UPS
Date test results needed: Normal Turn	Engineering Compliance	(1) Received By 8-12-13 9:00 ARI	(2) Received By Date / Time Company	(3) Received By Date / Time Company	(3) Received By Date / Time Company	Custody Seal Applied Yes No
Route results through: S. Flaherty		(1) Date / Time 8-12-13 9:00	(2) Date / Time Company	(3) Date / Time Company	(3) Date / Time Company	
Project manager signature: S. Flaherty		(1) Company ARI	(2) Company	(3) Company	(3) Company	



BP Whiting Refinery

FCCU 500

Test Date: 8/9/13

## **APPENDIX D**

## **Calibration Data**

---

**APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION**  
**USING CALIBRATED CRITICAL ORIFICES**  
**5-POINT ENGLISH UNITS**

Meter Console Information	
Console Model Number	MC522
Console Serial Number	40827
DGM Model Number	MS4
DGM Serial Number	DGM 504004

Calibration Conditions	
Date	4-Dec-12
Barometric Pressure	29.4 in Hg
Theoretical Critical Vacuum <sup>1</sup>	13.9 in Hg
Calibration Technician	B. Crane

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647 or/in Hg

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient, K<sub>1</sub>, must be entered in English units, (ft<sup>3</sup>·s<sup>1/2</sup>·R<sup>-1/4</sup>)/(in·Hg<sup>1/2</sup>·min).

Metering Console				Critical Orifice			
Run Time	DGM Orifice	Volume	Volume	Outlet Temp	Serial Number	Coefficient	Amb Temp
Elapsed (θ)	ΔH (P <sub>at</sub> )	Initial (V <sub>in</sub> )	Final (V <sub>out</sub> )	Initial (t <sub>in</sub> )			Final (t <sub>out</sub> )
min	in H <sub>2</sub> O	cubic feet	cubic feet	°F		see above <sup>2</sup>	°F
10.0	2.9	897.600	907.790	74	OX73	0.7780	75
11.0	1.7	880.300	888.760	71	OX83	0.5905	72
10.0	0.9	912.500	918.330	76	OX55	0.4455	74
13.0	0.6	923.100	928.980	77	OX48	0.3451	74
19.0	0.2	932.800	938.520	76	OX40	0.2303	75
							23

Standardized Data				Results			
Dry Gas Meter		Critical Orifice		Calibration Factor		Dry Gas Meter	
(V <sub>meas</sub> )	(Q <sub>meas</sub> )	(V <sub>cor</sub> )	(Q <sub>cor</sub> )	Value (Y)	Variation (ΔY)	Flowrate	ΔH @
cubic feet	cfm	cubic feet	cfm			Std & Corr (Q <sub>meas/corr</sub> )	(ΔH@)
9.943	0.994	9.874	0.987	0.993	-0.007	0.987	in H <sub>2</sub> O
8.277	0.752	8.267	0.752	0.999	-0.002	0.752	1.646
5.645	0.565	5.659	0.566	1.003	0.002	0.566	1.665
5.683	0.437	5.699	0.438	1.003	0.002	0.438	1.569
5.529	0.291	5.556	0.292	1.005	0.004	0.292	1.559
				1.000	Y Average		1.464
							1.581
							ΔH@ Average

CAL-MASTER-METER-WORKBOOK-2037-REV1

[Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature

Date 12-4-12

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Pre -Test



Meter Box: 40827

Calibrator: B. Crane

Date: 12/4/2012

Barometric: 29.37

Ambient Temp: 71

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	1	0.22	0	0.00	1	0.22
100	100	0.00	99	-0.18	100	0.00
200	202	0.30	201	0.15	202	0.30
300	302	0.26	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	500	0.00	499	-0.10	500	0.00

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	1	0.22	0	0.00	1	0.22
100	100	0.00	99	-0.18	100	0.00
200	202	0.30	202	0.30	202	0.30
300	302	0.26	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	500	0.00	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	1	0.22
200	202	0.30
400	398	-0.23
600	601	0.09
800	803	0.24
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1400	0.00
1600	1603	0.15
1800	1801	0.04

Revised 10/03

**APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION  
USING CALIBRATED CRITICAL ORIFICES  
3-POINT ENGLISH UNITS**

Meter Console Information	
Console Model Number	MC522
Console Serial Number	40827
DGM Model Number	MS-4
DGM Serial Number	504004.00

Calibration Conditions	
Date	12-Aug-13
Barometric Pressure	29.2 in Hg
Theoretical Critical Vacuum <sup>1</sup>	13.8 in Hg
Calibration Technician	B. Crane

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647 or/in Hg

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient, K', must be entered in English units, (ft<sup>3</sup>·°R<sup>1/2</sup>)/(in·Hg<sup>1/2</sup>·min).

Calibration Data			
Metering Console		Critical Orifice	
Run Time	Volume	Outlet Temp	Amb Temp
Elapsed (t)	Initial (V <sub>ini</sub> )	Final (t <sub>end</sub> )	Initial (t <sub>amb</sub> )
min	cubic feet	°F	°F
10.0	535.600	81	77
10.0	543.340	78	76
10.0	551.080	78	77
	558.840	79	76
			18
			18
			18

Results			
Standardized Data		Dry Gas Meter	
Critical Orifice		Flowrate	
(V <sub>meas</sub> )	(V <sub>cr,exp</sub> )	Std & Corr	ΔH @
cubic feet	cubic feet	(Q <sub>std,corr</sub> )	0.75 SCFM
		cfm	(ΔH@)
7.424	7.430	0.743	in H <sub>2</sub> O
7.445	7.430	0.743	1.670
7.457	7.430	0.743	1.674
			0.002
			0.001
			ΔH@ Average
			1.672

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature

Date 8-12-13

ARI Environmental, Inc.  
 Gas Meter Thermometer Calibration Data Form  
 Post-Test



Meter Box: 40827  
 Calibrator: B. Crane  
 Date: 8/12/2013  
 Barometric: 29.2  
 Ambient Temp: 78

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	3	0.65	3	0.65	3	0.65
100	100	0.00	100	0.00	100	0.00
200	204	0.61	204	0.61	204	0.61
300	302	0.26	302	0.26	302	0.26
400	400	0.00	400	0.00	400	0.00
500	500	0.00	500	0.00	500	0.00

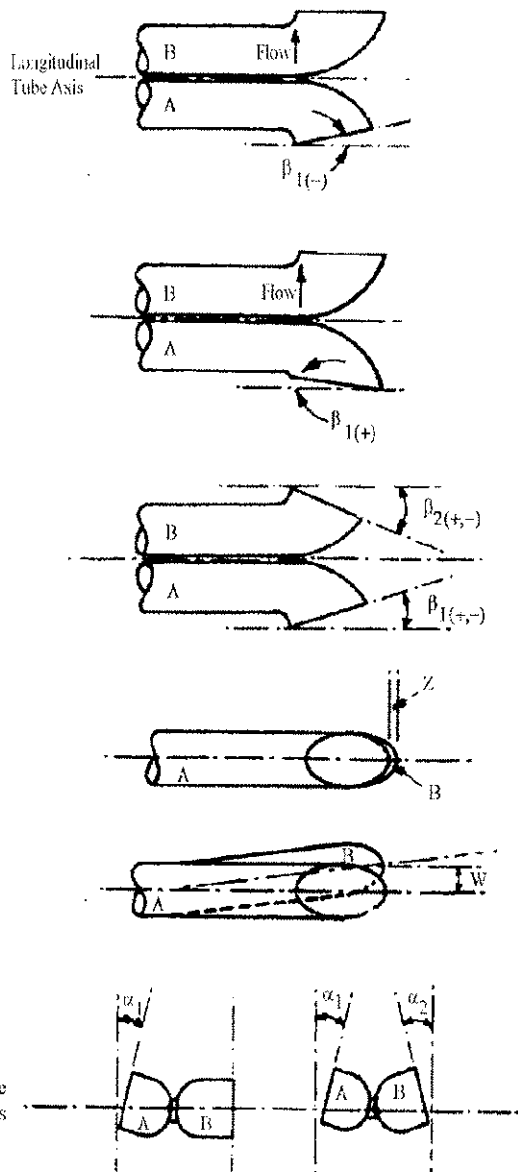
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	3	0.65	3	0.65	3	0.65
100	100	0.00	101	0.18	101	0.18
200	204	0.61	204	0.61	204	0.61
300	303	0.39	303	0.39	303	0.39
400	400	0.00	401	0.12	401	0.12
500	500	0.00	500	0.00	500	0.00

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	3	0.65
200	204	0.61
400	400	0.00
600	603	0.28
800	805	0.40
1000	1004	0.27

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1202	0.12
1400	1400	0.00
1600	1603	0.15
1800	1801	0.04

# Pitot Tube Inspection Data

Client Name: \_\_\_\_\_

Pre-Sample  
Date: 10/27/2012Post-Sample  
Date: 8/15/2013

Y	level?	Y
N	obstructions?	N
N	damaged?	N
0	$-10^\circ < \alpha_1 < +10^\circ$	0
0	$-10^\circ < \alpha_2 < +10^\circ$	1
0	$-5^\circ < \beta_1 < +5^\circ$	0
1	$-5^\circ < \beta_2 < +5^\circ$	1
0	$\gamma$	1
2	$\theta$	0
0.680	A	0.68
0.340	$0.2625 < P_A < 0.375$	0.340
0.340	$0.2625 < P_B < 0.375$	0.340
0.250	$0.1875 \leq D_t \leq 0.375$	0.250
0.000	$A \tan \gamma < 0.125''$	0.012
0.02374	$A \tan \theta < 0.03125''$	0.00000
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

**Comments:** 10' effective length M5 probe with s-type pitot tube, 1.4" tips, K-type thermocouple enclosed in a 1.5" OD sheath.

Pitot tube/probe number 354 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

*[Signature]*  
8/15/13 D-5

**ARI Environmental Inc.**  
**Thermocouple Calibration Data Form**



**Calibrator:** B. Crane  
**Thermocouple ID.** 354  
**pretest**                      **posttest**  
**Date:** 10/27/2012              8/15/2013  
**Barometric:** 29.57              29.41  
**Reference Thermometer = Mercury in glass**

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
<b>Pre- Test</b>	T.C	Ice Water	32.0	32.0	0.00
		Ambient	67.4	67.3	0.02
		Heat Source	300.0	299.2	0.11
<b>Post- Test</b>	T.C	Ice Water	32.1	32.0	0.02
		Ambient	74.2	74.5	-0.06
		Heat Source	296.8	297.1	-0.04

$$a \text{ (temp. diff.)} = (\text{ref.temp} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$$

Where  $-1.5 < a < 1.5$



BP Whiting Refinery  
FCCU 500  
Test Date: 8/9/13

## APPENDIX E

## Process Data

---

MAIN BODY OF REPORT Process Data Summary Tables

NSPS-Ja	Run	5F-1	5F-2	5F - 3	Test Average
	FCCU Regenerator Coke Burn, lb/hr	63695	63186	63581	63487
	ESP Total Primary Power, KW	96	94	95	95
	ESP Total Secondary Current, Amps	2973	2978	2975	2975
	SO <sub>2</sub> , ppm @ 0%O <sub>2</sub>	6.1	6.4	6.6	6.3
	NO <sub>x</sub> , ppm @ 0%O <sub>2</sub>	39.4	33.0	32.7	35.0

APPENDIX Additional Process Data Summary - BP CONFIDENTIAL BUSINESS INFORMATION

NSPS-Ja	Run	5F-1	5F-2	5F - 3	Test Average
	Ammonia Flow to ESP, lb/hr	187	139	139	155
	SO <sub>2</sub> Additive Rate, PPD	150	150	150	150.0
	Ammonia Slip (Calc), ppm	8.3	6.2	6.1	6.9
	Regenerator Plenum Outlet Temperature, F	1358	1359	1358	1358
	Average ESP Inlet Temperature, F	660	661	661	661
	Total Feed Rate, BPD	105	105	105	105

[illegible]

[illegible]

[illegible]



BP Whiting Refinery  
FCCU 500  
Test Date: 8/9/13

## **APPENDIX F**

## **Test Program Qualifications**

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## Test Program Qualifications

---

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-12-4), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

### **Steven Flaherty**

Mr. Flaherty is a Senior Project Manager with ARI. His 11 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

### **Robert Burton**

Mr. Burton is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Burton has 6 years of experience in conducting various source emission test programs. Mr. Burton is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

### **W. Alex Hildreth**

Mr. Hildreth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

### **Tim Martch**

Mr. Martch is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

### **Brett O'Leary**

Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2013

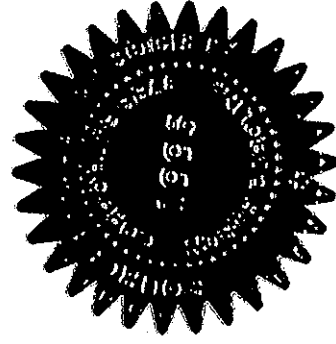
Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

C. David Baggett, QSTI/QSTO Review Board

John R. Smith, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual


LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

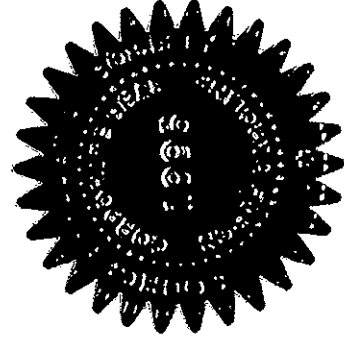
### **MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**


ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2013


  
Peter R. Westlin, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



  
John R. Smith, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

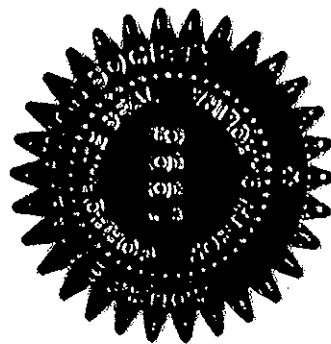
**GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**

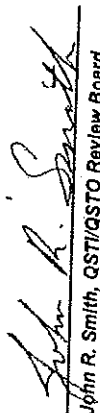
ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2008 AND EFFECTIVE UNTIL NOVEMBER 25<sup>H</sup>, 2013

  
Peter R. Westlin, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



  
John R. Smith, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

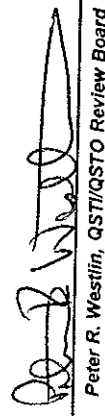
LET IT BE KNOWN THAT

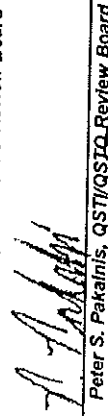
**STEVEN M. FLAHERTY**

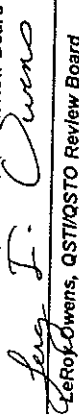
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

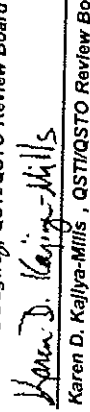
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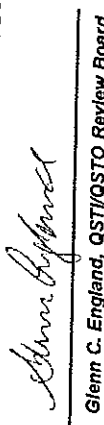
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

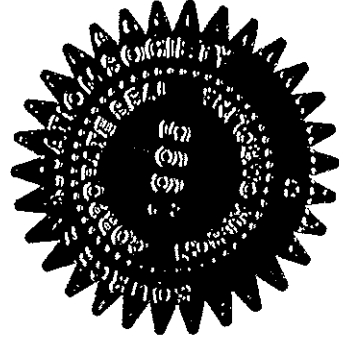
  
Leroy Owens, QSTI/QSTO Review Board

  
C. David Bagweff, QSTI/QSTO Review Board

  
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APPLICATION  
NO.  
2008-237



**Appendix 3b – FCU 600 Performance Testing  
December 2013**

# TEST REPORT

## COMPLIANCE EMISSION TEST NSPS, SUBPART Ja FLUIDIZED CATALYTIC CRACKING UNIT 600

BP PRODUCTS NORTH AMERICA, INC.  
WHITING, INDIANA

PREPARED FOR:

***BP PRODUCTS NORTH AMERICA, INC.***

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ARI Project No. 566-102  
ARI Proposal No. 12313  
BP Purchase Order No. 3000262112  
Test Date: December 10, 2013



## TABLE OF CONTENTS

<b>SECTIONS</b>	<b>PAGE</b>
<b>REPORT CERTIFICATION</b>	ii
Section 1 <b>INTRODUCTION AND SUMMARY</b>	1-1
Section 2 <b>TESTING AND ANALYTICAL PROCEDURES</b>	2-1
2.1 Overview	2-1
2.2 Methodology	2-1
2.2.1 Sampling Locations (USEPA Method 1)	2-1
2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)	2-1
2.2.3 Molecular Weight (USEPA Method 3)	2-1
2.2.4 Flue Gas Moisture Content (USEPA Method 4)	2-1
2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)	2-2
2.2.5.1 Sampling Apparatus	2-2
2.2.5.2 Sampling Procedures	2-2
2.2.5.3 Sample Recovery Procedures	2-4
2.2.5.4 Analytical Procedures	2-4
Section 3 <b>PROCESS DESCRIPTION</b>	3-1
Section 4 <b>TEST RESULTS</b>	4-1
<b>FIGURES</b>	
Figure 2-1 USEPA Method 5F Nonsulfate Particulate Matter Sampling Train	2-3
<b>TABLES</b>	
Table 1-1 Summary of FCCU 600 Stack Nonsulfate PM Test Results	1-1
Table 3-1 FCCU 600 Stack Process Data Summary	3-1
Table 4-1 FCCU 600 Stack Nonsulfate PM Emission Test Results	4-2
<b>APPENDICES</b>	
Appendix A Calculation Summaries	
Appendix B Field Data	
Appendix C Analytical Data	
Appendix D Calibration Data	
Appendix E Process Data	
Appendix F Test Program Qualifications	



## REPORT CERTIFICATION

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### STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

A handwritten signature in black ink, appearing to read "Steve Flaherty", is written over a horizontal line.

Steve Flaherty, QSTI  
Senior Project Manager, Source Testing Division  
ARI Environmental, Inc.

A handwritten signature in black ink, appearing to read "Hank Taylor", is written over a horizontal line.

Hank Taylor, QI  
Quality Assurance Manager, Source Testing Division  
ARI Environmental, Inc.

**SECTION ONE****Introduction and Summary**

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 600 stack at their refinery located in Whiting, Indiana. Testing was conducted on December 10, 2013.

Three 60-minute test runs were conducted on the FCCU 600 stack to determine the concentration and emission rate of filterable nonsulfate PM. The emission test was performed to fulfill the testing requirements of the New Source Performance Standards (NSPS), Subpart Ja.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Brandon Mik of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Jeff Goldfine, Jayce Best and Alex Hildreth of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

**TABLE 1-1. SUMMARY OF FCCU 600 STACK NONSULFATE PM TEST RESULTS**

TEST RUN NO.	:	5F-1	5F-2	5F-3	
TEST DATE	:	12/10/2013	12/10/2013	12/10/2013	
TEST TIME	:	<u>15:38-16:40</u>	<u>17:03-18:05</u>	<u>18:35-19:38</u>	<u>Average</u>

**Nonsulfate Filterable PM**

Concentration				
grains/dscf	0.0060	0.0045	0.0022	0.0042
mg/dscm	13.720	10.269	5.028	9.672
Emission rate				
lb/hr	6.54	4.86	2.39	4.60
lb/1,000 lb coke burn	0.191	0.143	0.070	0.135



## **SECTION TWO**

## **Testing and Analytical Procedures**

---

### **2.1 OVERVIEW**

ARI conducted a compliance emission test on the FCCU 600 stack at the BP refinery located in Whiting, Indiana.

Three 60-minute test runs were conducted on December 10, 2013 to determine the concentration and emission rate of filterable nonsulfate PM.

### **2.2 METHODOLOGY**

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

#### **2.2.1 Sampling Locations (USEPA Method 1)**

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted at the FCCU 600 stack in the two (2) sampling ports provided in the 96-inch diameter stack. The sample ports are located approximately 840 inches downstream and 480 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

#### **2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)**

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

#### **2.2.3 Molecular Weight (USEPA Method 3)**

The stack gas oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations of each collected bag. The nitrogen (N<sub>2</sub>) content was calculated as the difference.

#### **2.2.4 Flue Gas Moisture Content (USEPA Method 4)**

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Method 5F procedures described in Subsection 2.2.5.



## SECTION TWO

## Testing and Analytical Procedures

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### 2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)

Nonsulfate PM sampling was conducted in accordance with USEPA Method 5F using an Apex Instruments, Inc. sampling train.

#### 2.2.5.1 Sampling Apparatus

The PM sampling train met design specifications established by the USEPA. Assembled by ARI personnel, it consisted of the following:

Nozzle – Stainless steel, with sharp, tapered leading edge.

Probe – Stainless steel with a heating system capable of maintaining a probe exit temperature of 320°F ±25°F.

Pitot Tube - Type-S attached to probe for monitoring stack gas velocity.

Filter Holder - Borosilicate glass filter with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 320°F ±25°F during sampling. A quartz fiber filter meeting the requirements of USEPA Method 5F was used.

Draft Gauge – Inclined manometer with a readability of 0.01-in. H<sub>2</sub>O in the 0 to 1-in. range and 0.1-in. H<sub>2</sub>O in the 1 to 10-in. range.

Impingers – Four (4) impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second impinger was of the Greenburg-Smith design with a standard tip.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

#### 2.2.5.2 Sampling Procedures

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture and range of velocity head were measured according to procedures described in USEPA Methods 1 through 4. The sampling train was set up with the probe and filter holder as shown in Figure 2-1. The first and second impingers initially contained 100 milliliters (mL) of deionized/distilled water. The third impinger was initially empty. The fourth impinger contained 200 grams of silica gel.

## SECTION TWO

## Testing and Analytical Procedures

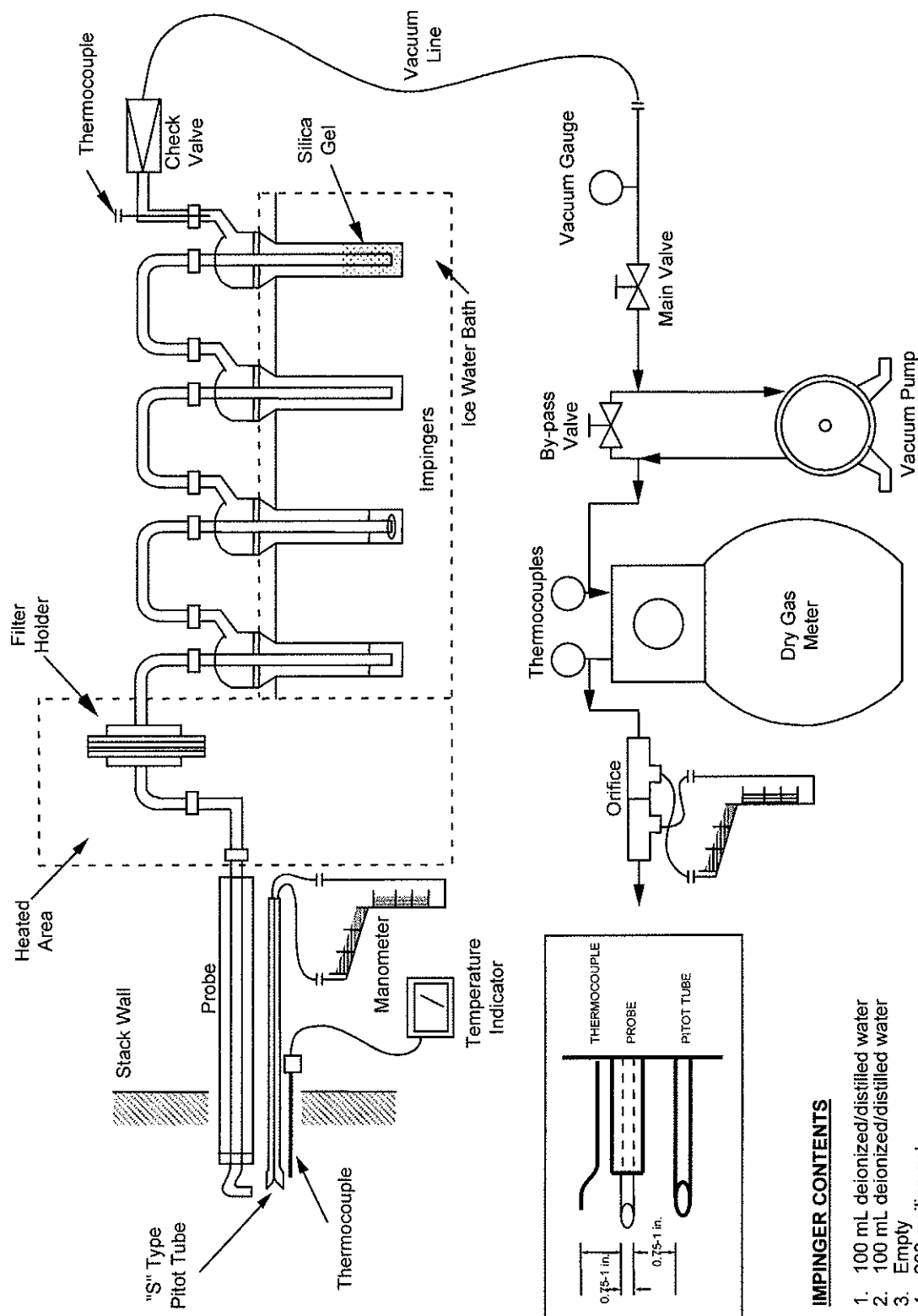


FIGURE 2-1. USEPA METHOD 5F NONSULFATE PARTICULATE MATTER SAMPLING TRAIN



## SECTION TWO

## Testing and Analytical Procedures

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The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft<sup>3</sup>/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was leak-checked by the same procedure, but at the highest vacuum attained during the test run. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

### 2.2.5.3 Sample Recovery Procedures

After sampling was completed and the final leak checks performed, the filter and probe (front-half) were disconnected from the impinger train. The sample fractions were recovered as follows:

Container 1 - The filter holder was sealed.

Container 2 - Loose PM and deionized/distilled water washings from all sample-exposed surfaces prior to the filter were placed in a glass jar, sealed and labeled. PM was removed from the probe liner, nozzle and fitting with the aid of a brush and deionized/distilled water rinsing. The liquid level was marked after the container was sealed.

Container 3 - A minimum of 200 mL of deionized/distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

The contents of impingers 1 through 3 were measured for volume and then discarded. The contents of the fourth impinger (silica gel) were placed in a polyethylene bottle for subsequent weighing to the nearest gram.

### 2.2.5.4 Analytical Procedures

The analytical procedures followed those described in USEPA Method 5F.

The filter from Container 1 was cut into small pieces and placed in a 125 mL Erlenmeyer flask equipped with an air condenser. The sample container was rinsed with water and placed into the same flask as the filter pieces. The contents of the flask were refluxed on a hot plate for 6 to 8 hours. The solution was then cooled and transferred to a 500 mL volumetric flask. The contents of Container 2 (probe rinse) were placed in the 500 mL volumetric flask with the filter solution. The contents were then diluted to exactly 500 mL with water.

The sample was allowed to settle, and then a pipette was used to deliver 5 mL of the solution into a 50 mL volumetric flask. The aliquot was diluted to exactly 50 mL with water. The final solution was analyzed in duplicate by ion chromatography for sulfate content (SO<sub>4</sub><sup>2-</sup>). The duplicate samples agreed within 5% of their mean and were compared to a 5-point standard calibration curve.



## SECTION TWO

## Testing and Analytical Procedures

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After the sulfate analysis, the remaining contents of the volumetric flask were transferred to a tared 250 mL beaker. The flask was carefully rinsed with water to make sure that all PM was transferred to the tared beaker. The beaker was transferred to an oven and heated to 105°C until approximately 100 mL of solution remained. The beaker was allowed to cool, after which five (5) drops of phenolphthalein indicator were added. Concentrated ammonium hydroxide was added until the solution turned pink. The sample was returned to the oven and evaporated to dryness at 105°C. The samples were then cooled, placed in a desiccator and subsequently weighed to a constant weight.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

**SECTION THREE****Process Description**

The FCCU 600, constructed in 1946, is identified as Unit ID 240 and rated at 80,000 barrels per day. This facility converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

**TABLE 3-1. FCCU 600 STACK PROCESS DATA SUMMARY**

TEST RUN NO.	5F-1	5F-2	5F-3	Average
FCCU Regenerator Coke Burn, lb/hr	34,194	34,131	33,943	34,089
ESP Total Primary Power, KW	66	66	66	66
ESP Total Secondary Current, mA	2,296	2,298	2,299	2,298
SO <sub>2</sub> , ppm @ 0% O <sub>2</sub>	2.8	2.0	2.7	2.5
NO <sub>x</sub> , ppm @ 0% O <sub>2</sub>	0.2	0.0	0.0	0.1



## **SECTION FOUR**

## **Test Results**

---

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

**SECTION FOUR****Test Results****TABLE 4-1. FCCU 600 STACK NONSULFATE PM EMISSION TEST RESULTS**

RUN NO.	:	5F-1	5F-2	5F-3	
TEST DATE	:	12/10/2013	12/10/2013	12/10/2013	
TEST TIME	:	<u>15:38 - 16:40</u>	<u>17:03 - 18:05</u>	<u>18:35 - 19:38</u>	<u>Average</u>

**Process Data**

Coke burn rate, lb/hr	34,194	34,131	33,943	34,089
-----------------------	--------	--------	--------	--------

**Stack Gas Parameters**

Temperature, °F	638.6	640.4	640.4	639.8
Velocity, av. ft/sec	117.8	118.8	119.5	118.7
Volumetric flow, acfm	355,326	358,300	360,386	358,004
Volumetric flow, scfm	168,560	169,688	170,675	169,641
Volumetric flow, scfh	10,113,599	10,181,258	10,240,518	10,178,458
Volumetric flow, dscfm	127,180	126,454	126,782	126,805
Volumetric flow, dscfh	7,630,772	7,587,246	7,606,899	7,608,306
Mass Flow, Mlb/hr db	611.9	608.3	609.5	609.9
Moisture, av. % vol	24.5	25.5	25.7	25.2
Molecular weight, lb/lb-mole db	30.89	30.89	30.87	30.88
Carbon Dioxide, av. % vol	17.5	17.4	17.3	17.4
Oxygen, av. % vol	2.3	2.6	2.5	2.5

**Particulate Sample**

Time, min.	60.0	60.0	60.0	60.0
Volume, dscf	50.011	51.449	49.379	50.280
Filterable nonsulfate PM, mg	19.43	14.96	7.03	13.81
Isokinetic ratio, %	104.1	107.7	103.1	104.9

**Filterable Nonsulfate PM**

Concentration				
grains/dscf	0.0060	0.0045	0.0022	0.0042
mg/dscm	13.720	10.269	5.028	9.672
x 10 <sup>-6</sup> lb/dscf	0.857	0.641	0.314	0.604
Emission rate				
lb/hr	6.54	4.86	2.39	4.60
lb/1,000 lb coke burn	0.191	0.143	0.070	0.135



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## APPENDIX A

## Calculation Summaries

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## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 600 Exhaust  
**Date:** 12/10/2013  
**Run #:** 5F-1

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.5 %
Oxygen (O <sub>2</sub> ):	2.3 %
Nitrogen (N <sub>2</sub> ):	80.2 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2455 dimensionless
Stack Temperature (T <sub>s</sub> ):	638.6 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.4164 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.892 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.727 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.532 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 117.817 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 355,326 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 168,560 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 10,113,599 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 127,180 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,630,772 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, IN  
Source: FCCU 600 Exhaust  
Date: 12/10/2013  
Run #: 5F-1

## Data Input:

Volume metered ( $V_m$ ):	46.480 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg
Meter sample rate ( $\Delta H$ ):	2.24 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	28.5 °F
Volume of moisture collected ( $V_{lc}$ ):	345.7 milliliters
Stack Temperature ( $T_s$ ):	638.6 °F
Static Pressure ( $S_t$ ):	-1.2 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 50.011 \text{ dscf}$$

### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 16.272 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2455 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 24.55 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) \times 0.5556) + 273 = 610.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( A \left( \frac{B}{(T_{s(°K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 171.0725 B_{wo}$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$= 24.55 \%$$



USEPA Method 5F (Non-Sulfate PM)  
Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 600 Exhaust  
Date: 12/10/2013  
Run #: 5F-1

**Data Input**

Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg	<u>Particulate Weight:</u>	
Stack pressure ( $P_s$ ):	29.53 inches Hg Abs.	Filterable:	19.43 milligrams
Test length ( $\theta$ ):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2410 inches		
Sample nozzle area ( $A_n$ ):	0.000317 $ft^2$		
Stack temperature ( $T_s$ ):	638.6 $^{\circ}F$		
Volume metered ( $V_{mstd}$ ):	50.011 $ft^3$		
Stack gas velocity ( $V_s$ ):	117.817 feet/second	Coke Burn Rate ( $R_c$ ):	34,194 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	7,630,772 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2455 %		

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0  $^{\circ}F$ ):**

**Percent Isokinetic:**

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 104.1 \% \text{ isokinetic}$$

**Method 5-F Particulate Concentration:**

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0060 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 13.7204 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.857 \times 10^{-6} \text{ lb/dscf}$$

**Method 5-F Particulate Emission Rate:**

$$E_p = C_s^1 \times Q_{std} = 6.537 \text{ lb/hr}$$

$$\text{pmr}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.1912 \text{ lb}/1000\text{lb coke burn}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 600 Exhaust  
**Date:** 12/10/2013  
**Run #:** 5F-2

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.4 %
Oxygen (O <sub>2</sub> ):	2.6 %
Nitrogen (N <sub>2</sub> ):	80.0 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2548 dimensionless
Stack Temperature (T <sub>s</sub> ):	640.4 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.4239 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.888 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.604 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.532 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 118.803 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 358,300 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 169,688 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 10,181,258 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 126,454 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,587,246 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 600 Exhaust  
**Date:** 12/10/2013  
**Run #:** 5F-2

### Data Input:

Volume metered ( $V_m$ ):	47.235 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg
Meter sample rate ( $\Delta H$ ):	2.36 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	22.7 °F
Volume of moisture collected ( $V_{lc}$ ):	373.7 milliliters
Stack Temperature ( $T_s$ ):	640.4 °F
Static Pressure ( $St$ ):	-1.2 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 51.449 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 17.590 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2548 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 25.48 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 611.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{10^{\left( A \cdot \left( \frac{B}{(T_{s(K)} - C) \right) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 173.3234 B_{wo}$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 25.48 \%$$



USEPA Method 5F (Non-Sulfate PM)  
Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 600 Exhaust  
Date: 12/10/2013  
Run #: 5F-2

**Data Input**

Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg	<u>Particulate Weight:</u>	
Stack pressure ( $P_s$ ):	29.53 Inches Hg Abs.	Filterable:	14.96 milligrams
Test length ( $\theta$ ):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2410 inches		
Sample nozzle area ( $A_n$ ):	0.000317 ft <sup>2</sup>		
Stack temperature ( $T_s$ ):	640.4 °F		
Volume metered ( $V_{mstd}$ ):	51.449 ft <sup>3</sup>		
Stack gas velocity ( $V_s$ ):	118.803 feet/second	Coke Burn Rate ( $R_c$ ):	34,131 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	7,587,246 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2548 %		

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Percent Isokinetic:**

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 107.7 \% \text{ isokinetic}$$

**Method 5-F Particulate Concentration:**

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0045 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 10.2686 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.641 \times 10^{-6} \text{ lb/dscf}$$

**Method 5-F Particulate Emission Rate:**

$$E_p = C_s^1 \times Q_{std} = 4.865 \text{ lb/hr}$$

$$\text{pmr}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.1425 \text{ lb}/1000\text{lb coke burn}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, IN  
Source: FCCU 600 Exhaust  
Date: 12/10/2013  
Run #: 5F-3

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.3 %
Oxygen (O <sub>2</sub> ):	2.5 %
Nitrogen (N <sub>2</sub> ):	80.2 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2572 dimensionless
Stack Temperature (T <sub>s</sub> ):	640.4 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.4310 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.868 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.559 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.532 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 119.494 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 360,386 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 170,675 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 10,240,518 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 126,782 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,606,899 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 600 Exhaust  
**Date:** 12/10/2013  
**Run #:** 5F-3

### Data Input:

Volume metered ( $V_m$ ):	45.785 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg
Meter sample rate ( $\Delta H$ ):	2.28 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	27.4 °F
Volume of moisture collected ( $V_{lc}$ ):	363.2 milliliters
Stack Temperature ( $T_s$ ):	640.4 °F
Static Pressure ( $St$ ):	-1.2 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 49.379 \text{ dscf}$$

#### Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 17.096 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = 0.2572 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 25.72 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 611.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{10^{\left( \frac{A \cdot B}{(T_{s(K)} - C) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 173.3234 B_{wo}$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{saturated} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 25.72 \%$$



# USEPA Method 5F (Non-Sulfate PM) Particulate Calculation Summary

Client: BP  
Location: Whiting, IN  
Source: FCCU 600 Exhaust  
Date: 12/10/2013  
Run #: 5F-3

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.53 Inches Hg Abs.	Filterable:	7.03 milligrams
Test length ( $\theta$ ):	60.0 minutes		
Sample nozzle diameter ( $D_n$ ):	0.2410 inches		
Sample nozzle area ( $A_n$ ):	0.000317 $ft^2$		
Stack temperature ( $T_s$ ):	640.4 $^{\circ}F$		
Volume metered ( $V_{mstd}$ ):	49.379 $ft^3$		
Stack gas velocity ( $V_s$ ):	119.494 feet/second	Coke Burn Rate ( $R_c$ ):	33,943 lb/hr
Stack gas volumetric flow ( $Q_{std}$ ):	7,606,899 dscf/hour		
Fractional Moisture content ( $B_{wo}$ ):	0.2572 %		

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 $^{\circ}F$ ):

### Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})} = 103.1 \% \text{ isokinetic}$$

### Method 5-F Particulate Concentration:

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0022 \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 5.0277 \text{ mg/dscm}$$

$$C_s^1 = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.314 \times 10^{-6} \text{ lb/dscf}$$

### Method 5-F Particulate Emission Rate:

$$E_p = C_s^1 \times Q_{std} = 2.388 \text{ lb/hr}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 0.0704 \text{ lb/1000lb coke burn}$$



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## **APPENDIX B**

## **Field Data**

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TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting  
Date 5/20/13  
Sampling Location FECCV 600  
Inside of Far Wall to  
Outside of Port (Distance C) 107.75 in.  
Inside of Near Wall to  
Outside of Port (Distance D) 11.75 in.  
Stack ID (Distance C-Distance D) 96 in.  
Port Distance Downstream From Disturbance (B) 840 in.  
Port Distance Upstream From Disturbance (A) 480 in.  
Equivalent Diameters Downstream From Disturbance (B) 8.8 ( $\geq 2.0$ )  
Equivalent Diameters Upstream From Disturbance (A) 5.0 ( $\geq 0.5$ )  
Number of Ports Used 2 Traverse Points / Port 6

1 2 3 4 5 6

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	96	4.22	11.75	15.97
2	0.146		14.01		25.76
3	0.296		28.41		40.16
4	0.704		67.58		79.33
5	0.854		81.98		93.73
6	0.956		91.77		103.52
7					
8					
9					
10					
11					
12					

For Stacks / Ducts  $\leq 24$  inches ID - No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts  $> 24$  inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:  
Completeness \_\_\_\_\_ Legibility \_\_\_\_\_ Accuracy \_\_\_\_\_ Specifications \_\_\_\_\_  
Method 1 Calculator Signature/Date Ray Hays 5/20/13  
Field Supervisor Signature/Date \_\_\_\_\_

Note: Sketch Stack/Ports/Control Device on Back of Form

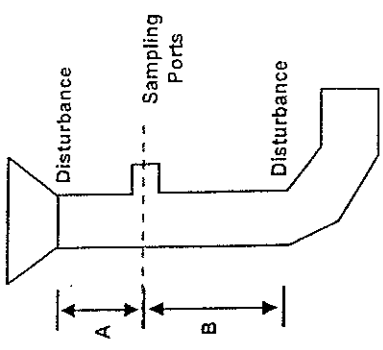
Equivalent Diameters Downstream From Disturbance (B) = [Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = [Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =  $[(2 \times L \times W) / (L + W)]$

Port ID 5 in. (for monorail bracket specs.)  
Port Length Outside of Stack 4 in. (for monorail bracket specs.)

outer insulation  
6" Bracket w/ spacing shims or c-clamps  
use FECCV 600 Boards



LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

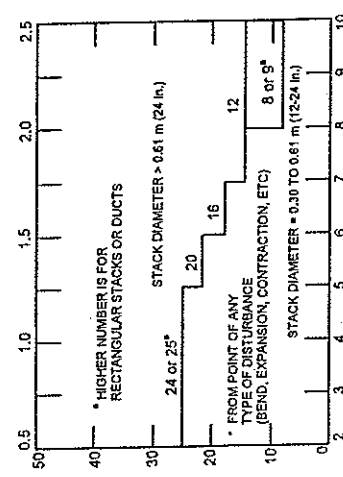
PTS	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3	83.3	62.5	50.0	41.7	35.7	31.3	27.8	
4		87.5	70.0	58.3	50.0	43.8	38.9	
5			90.0	75.0	64.3	56.3	50.0	
6				91.7	78.9	68.8	61.1	
7					92.9	81.3	72.2	
8						93.8	83.3	
9							94.4	

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

PTS	4	5	6	8	10	12
1	8.7	14.4	3.2	2.5	2.1	
2	25.0	14.8	10.5	8.2	6.7	
3	75.0	23.8	19.4	14.6	11.8	
4	93.3	17.4	32.3	22.8	17.7	
5		16.4	67.7	34.2	25.0	
6		35.3	80.8	65.5	35.6	
7		85.5	77.4	64.4		
8		56.8	85.4	75.0		
9			91.8	82.3		
10			97.4	88.2		
11				93.3		
12				97.9		

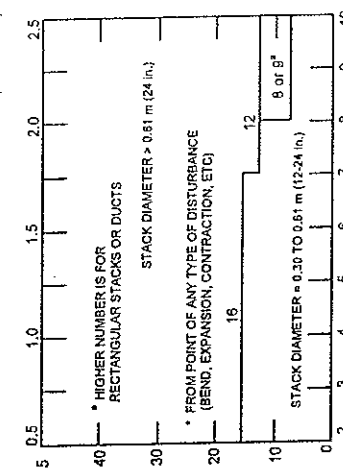
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

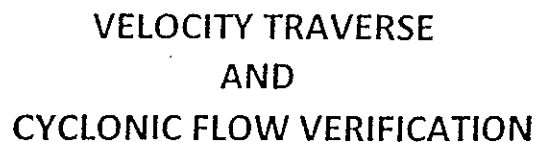
MINIMUM NUMBER OF TRAVERSE POINTS FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS FOR VELOCITY (NON-ISOKINETIC) TRAVERSES



### SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. \_\_\_\_\_  
 STATIC, in. H<sub>2</sub>O \_\_\_\_\_  
 START: \_\_\_\_\_ STOP: \_\_\_\_\_  
 PRE-TEST: \_\_\_\_\_ POST-TEST: \_\_\_\_\_

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

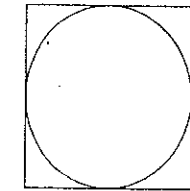


# FIELD DATA

PLANT BP  
DATE 12-16-13  
LOCATION WATKINS JAIL  
OPERATOR JE  
STACK NO. 600-51-1  
RUN NO. 600-51-1  
SAMPLE BOX NO. 601013  
METER BOX NO. 1538  
START TIME

AMBIENT TEMPERATURE  
BAROMETRIC PRESSURE  
ASSUMED MOISTURE, %  
PROBE LENGTH, in.  
NOZZLE DIAMETER, in.  
STACK DIAMETER, in.  
MINUTES PER POINT  
NUMBER OF PORTS

PROBE HEATER SETTING  
HEATER BOX SETTING  
METER  $H_a$   
 $C_p$  FACTOR  
 $Y_a$  FACTOR  
PITOT NO.



CLOCK TIME (Hr)	TRAVERSE POINT NUMBER	SAMPLING TIME (Hr)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (AP <sub>5</sub> )	VELOCITY (AP <sub>5</sub> )	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H <sub>2</sub> O		GAS SAMPLE VOLUME (Nm <sup>3</sup> )	GAS SAMPLE DRY GAS METER		FILTER EXIT TEMP. (°F)	PROBE TEMP. (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
							ACTUAL	DESIRED		INLET (T <sub>in</sub> ) (°F)	OUTLET (T <sub>out</sub> ) (°F)					
1538	1	1538	-1.2	636	1.9	1.9	2.1	2.1	678.630	31	31	311	312		56	2
1543	2	5		635	2.0	2.0	2.3	2.3	680.52	29	29	311	310		27	2
1548	3	10		638	2.1	2.1	2.4	2.36	682.46	29	29	312	301		28	2
1553	4	15		641	2.1	2.1	2.4	2.35	684.44	29	29	312	301		28	2
1603	5	20		643	2.2	2.2	2.5	2.47	686.53	28	28	313	307		29	2
1608	6	25		643	2.0	2.0	2.5	2.23	688.40	29	29	313	308		32	2
1613	7	30		641	2.1	2.1	2.4	2.35	690.37	29	29	314	308		33	2
1618	8	35		640	2.2	2.2	2.5	2.46	692.40	29	29	314	308		37	2
1623	9	40		637	2.0	2.0	2.2	2.24	694.40	28	28	316	307		39	2
1628	10	45		635	1.9	1.9	2.1	2.24	696.35	28	28	310	311		41	2
1633	11	50		631	1.8	1.8	2.0	2.03	698.26	28	28	311	310		41	2
1638	12	55		621	1.8	1.8	2.0	2.03	700.18	28	28	310	306		40	2
1643	1	00		638	1.9	1.9	2.1	2.02	702.02	28	28	321	317		39	2
1648	2	05		639	2.0	2.0	2.2	2.13	703.82	28	28	320	313		39	2
1653	3	10		640	2.1	2.1	2.3	2.21	705.72	28	28	318	312		39	2
1658	4	15		641	2.2	2.2	2.4	2.31	707.65	28	28	317	315		39	2
1703	5	20		641	2.2	2.2	2.4	2.34	709.62	28	28	318	312		41	2
1708	6	25		643	2.1	2.1	2.3	2.34	711.65	28	28	316	315		43	2
1713	7	30		642	2.1	2.1	2.3	2.34	713.61	28	28	316	312		44	2
1718	8	35		641	2.0	2.0	2.2	2.24	715.46	28	28	316	315		45	2
1723	9	40		637	1.9	1.9	2.1	2.13	717.43	28	28	313	307		47	2
1728	10	45		636	1.8	1.8	2.0	2.02	719.41	28	28	313	306		50	2
1733	11	50		630	1.8	1.8	2.0	2.02	721.41	28	28	313	306		49	2
1738	12	55		630	1.8	1.8	2.0	2.02	723.17	28	28	312	308		49	2
1743		00							725.10							
AVERAGE		60	-1.2	638.6	1.9164	1.9164	2.24		46.480	28.5		2320	2320		68	MAX 2

VOLUME OR WEIGHT OF LIQUID COLLECTED		IMPINGER				SILICA GEL WEIGHT
		VOLUME (ml) OR WEIGHT (g)				
		#2	#3	#4	#5	g
FINAL	358	175	0			211.7
INITIAL	100	100	0	SC		200.0
LIQUID COLLECTED	458	76	0			11.7
TOTAL LIQUID COLLECTED (specify ml or g)						But 2

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		17.5	2.3
TRIAL 2		17.5	2.3
TRIAL 3		17.5	2.3
Average		17.5	2.3

LEAK CHECK	
SYSTEM PRE: 1.00	CFM@15"H <sub>2</sub> O
POST: 1.00	CFM@15"H <sub>2</sub> O
PITOT PRE: 1.00	@ 3"H <sub>2</sub> O
POST: 1.00	@ 3"H <sub>2</sub> O



B-4

## FIELD DATA

PLANT	BP	AMBIENT TEMPERATURE	17	PROBE HEATER SETTING	320	WEIGHT OF PARTICULATE, mg	
DATE	11-10-13	BAROMETRIC PRESSURE	27.62	HEATER BOX SETTING	320	Filter No.	
LOCATION	Washing Bay	ASSUMED MOISTURE, %	7.07	METER H <sub>2</sub> O	1.97	Sample	
OPERATOR	AW	PROBE LENGTH, in.	48	C <sub>p</sub> FACTOR	1.000	Final wt.	
STACK NO.	ECU 600	NOZZLE DIAMETER, in.	0.58	Y <sub>2</sub> FACTOR	1.000	Tag wt.	
RUN NO.	600-M5F-2	STACK DIAMETER, in.	6.8	PITOT NO.	351	Wt. gain	
SAMPLE BOX NO.		MINUTES PER POINT	2.5				
METER BOX NO.		NUMBER OF POINTS	24				
START TIME	1403		24.45				

CLOCK TIME (hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (g) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (AF)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔP) in. H <sub>2</sub> O		GAS SAMPLE VOLUME (V <sub>m</sub> ) ft <sup>3</sup>	GAS SAMPLE DRY GAS METER		FILTER EXIT GAS TEMP. (°F)	PROBE TEMP. (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
						ACTUAL	DESIRED		INLET (T <sub>in</sub> ) °F	OUTLET (T <sub>out</sub> ) °F					
1303	1	0	-1.2	624	1.6	2.2	2.2	925.600	19	221	222			21	2
	2			636	2.0	2.3	2.3	927.62	20	220	220			22	2
1308	3	5		641	2.1	2.4	2.4	930.03	21	220	221			22	2
	4			641	2.1	2.4	2.4	931.37	21	217	221			24	2
1313	5	10		643	2.1	2.5	2.5	933.44	22	216	220			26	2
	6			644	2.0	2.3	2.3	935.47	23	219	219			31	2
1318	7	15		644	2.1	2.4	2.4	937.89	23	218	219			32	2
	8			643	2.2	2.6	2.6	937.42	23	212	222			32	2
1323	9	20		641	2.1	2.4	2.4	941.50	23	213	221			32	2
	10			640	2.0	2.3	2.3	943.99	23	210	220			33	2
1328	11	25		638	1.9	2.2	2.2	945.46	22	209	221			31	2
	12			633	1.8	2.1	2.1	947.41	22	207	222			37	2
1333/1335	1	30		636	1.8	2.1	2.1	948.14	22	219	220			35	2
	2			638	1.9	2.2	2.2	951.05	23	218	220			35	2
	3	35		640	2.1	2.5	2.5	952.99	23	221	219			36	2
	4			641	2.2	2.6	2.6	953.07	23	220	218			37	2
	5	40		643	2.2	2.6	2.6	956.91	24	225	219			37	2
	6	45		644	2.1	2.5	2.5	959.09	24	220	219			40	2
	7	45		644	2.1	2.5	2.5	961.14	24	217	219			41	2
	8			643	2.1	2.3	2.3	963.17	24	215	220			42	2
	9	50		643	2.1	2.5	2.5	965.19	24	215	220			44	2
	10			641	2.0	2.3	2.3	967.03	24	215	219			45	2
	11	55		640	2.0	2.3	2.3	968.93	24	210	220			45	2
	12			638	1.9	2.2	2.2	970.87	24	207	218			43	2
1305		60						972.835							
AVERAGE	24	60	-1.2	640.4	1.4259	2.36		472.33	22.7						

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT	
	#1	#2	#3	#4	#5	
FINAL	962	184	18			20.7
INITIAL	100	100	100			20.0
LIQUID COLLECTED	862	84	18			9.7
TOTAL LIQUID COLLECTED (specify ml or g)						293.7

LEAK CHECK	SYSTEM PRE: 2.00	CFM@15" Hg
POST: 2.00	CFM@15" Hg	
PITOT PRE: 1.00	CFM@15" Hg	
POST: 1.00	CFM@15" Hg	



# FIELD DATA

PLANT 1st  
DATE 12.10.10  
LOCATION WATER TOWER  
OPERATOR ST  
STACK NO. 2  
RUN NO. 600-3F-3  
SAMPLE BOX NO. 100  
METER BOX NO. 601013  
START TIME 7:55

PROBE HEATER SETTING 320  
HEATER BOX SETTING 320  
METER H<sub>2</sub>O 1.57  
C<sub>2</sub> FACTOR 0.80  
Y<sub>2</sub> FACTOR 1.000  
PITOT NO. 309

WEIGHT OF PARTICULATE, mg			
Filter No.			
Sample			
Final wt.			
Tare wt.			
Wt. gain			
TOTAL			

DIFFERENTIAL  
ACROSS METER  
ORIFICE  
(in. H<sub>2</sub>O)

VELOCITY  
HEAD  
(in. H<sub>2</sub>O)

STATIC  
PRESSURE  
(in. H<sub>2</sub>O)

STACK  
TEMP.  
(°F)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

ACTUAL  
(in. H<sub>2</sub>O)

DESIRED  
(in. H<sub>2</sub>O)

GAS SAMPLE  
VOLUME  
(Nm<sup>3</sup>)

TEMP AT  
DRY GAS METER  
INLET (°F)

EXIT  
TEMP.  
(°F)

PROBE  
TEMP.  
(°F)

AUXILIARY  
TEMP.  
(°F)

IMPINGER  
OUTLET  
TEMP.  
(°F)

PUMP  
VACUUM  
(in. Hg)

LAST  
IMPINGER  
OUTLET  
TEMP.  
(°F)

CLOCK  
TIME  
(Hr)

TRAVEL  
POINT  
NUMBER

VOLUME OR WEIGHT OF LIQUID COLLECTED		IMPINGER VOLUME (ml) OR WEIGHT (g)		SILICA GEL WEIGHT	
#1	#2	#3	#4	#5	#6
247	182	22			
100	100	0			
247	22	22			
TOTAL LIQUID COLLECTED (specify ml or g)					

ORSAT DATA		TIME		CO <sub>2</sub>		O <sub>2</sub>	
TRIAL 1				17.3		2.5	
TRIAL 2				17.3		2.5	
TRIAL 3				17.3		2.5	
Average				17.3		2.5	

LEAK CHECK  
SYSTEM PRE-TEST ☒ OK  
POST-TEST ☒ OK  
PITOT PRE-TEST ☒ OK  
POST-TEST ☒ OK



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## **APPENDIX C**

## **Analytical Data**

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# ***ANALYTICAL REPORT***

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 12/10/13

Lab Project Number: 08-606

COC Numbers(s): W02258

Analysis Date(s): 12/17 - 12/31/13

Analytical Method(s): USEPA Method 5F

***Prepared For:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Project Mgr: Steve Flaherty  
Phone: 847-487-1580 x117  
Fax: 847-487-1587  
E-mail: sflaherty@arienv.com

***Prepared By:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Eric Vogt, Lab Manager  
Phone: 847-487-1580 ext.116  
Fax: 847-487-1587  
E-mail: evogt@arienv.com

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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5  
State of Louisiana LDEQ/LELAP Certificate ID: 02010  
State of New Jersey NJDEP Certification ID: IL007



## *Project Narrative*

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### ***Sample Receipt and Acceptance Quality Assurance:***

Eight (8) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 12/16/13. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

### ***Analytical Quality Assurance:***

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

### ***Data Interpretation and Comments:***

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

### ***Scope of Accreditation:***


All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

### ***Laboratory Contact Information:***

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at [evogt@arienv.com](mailto:evogt@arienv.com).

Reviewed and Approved by:

  
\_\_\_\_\_  
Signature: Laboratory Manager

  
\_\_\_\_\_  
Date



# ANALYTICAL SUMMARY

CLIENT: BP  
LOCATION: Whiting, IN  
SOURCE: FCU 600  
SAMPLE DATE: 12/10/2013  
ANALYSIS: Particulates  
METHOD: USEPA Method 5F

page 1 of 2

ANALYST: J. Ruggaber  
DATE OF COMPLETION: 1/2/2014  
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3  
PROJECT NUMBER: 08-606

Identification		LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Particulate (mg)	Blank Corrected Total Partic. (mg)
M5F-1	FILTER	12484	877.7	113463.6	113464.1	-0.5	24.5	22.20
	BEAKER	12483	112561.7					
M5F-2	FILTER	12486	862.9	113881.0	113881.3	-0.3	21.9	19.60
	BEAKER	12485	112996.4					
M5F-3	FILTER	12488	887.8	118040.3	118040.0	0.3	12.8	10.60
	BEAKER	12487	117139.5					
DI Water Blank	BEAKER	12489	872.8	110398.5	110398.6	-0.1	2.3	-
Filter Blank	FILTER	12490	109523.5					

## Sample Concentration Calculations

Identification	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Diluted SO <sub>4</sub> Conc. (µg/ml)	Dilution Factor	Sample Volume (mls)	SO <sub>4</sub> mass (µg)	Corrected for Aliquot (mg)	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> mass (mg)	Corrected for Blank (mg)
M5F-1	0.0307	0.0296	0.0302	1.82	0.40	10	500	1996.73	2.02	2.77	2.77
M5F-2	0.0506	0.0502	0.0504	0.40	0.67	10	500	3337.82	3.37	4.64	4.64
M5F-3	0.0389	0.0387	0.0388	0.26	0.51	10	500	2569.59	2.60	3.57	3.57
Field Blank	<0.0014	<0.0014	<0.0014	0.00	<0.02	10	500	<90.07	<0.09	<0.13	-
Lab DI Water Blank	<0.0014	<0.0014	<0.0014	0.00	<0.02	-	-	-	-	-	-

ID	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Actual Conc. (µg/ml)	Spike Conc. (µg/ml)	Theo. Spike Conc. (µg/ml)	R (%)	Pass/Fail
spike 1	0.0580	0.0610	0.060	-2.52	0.79	0.38	0.40	94.5	Pass
spike 2	0.0565	0.0600	0.058	-3.00	0.77	0.36	0.40	90.4	Pass

spike prep: 8 mL of M5F-3 + 2 mL of 2 ppm std

## Non-Sulfate Particulate Weight

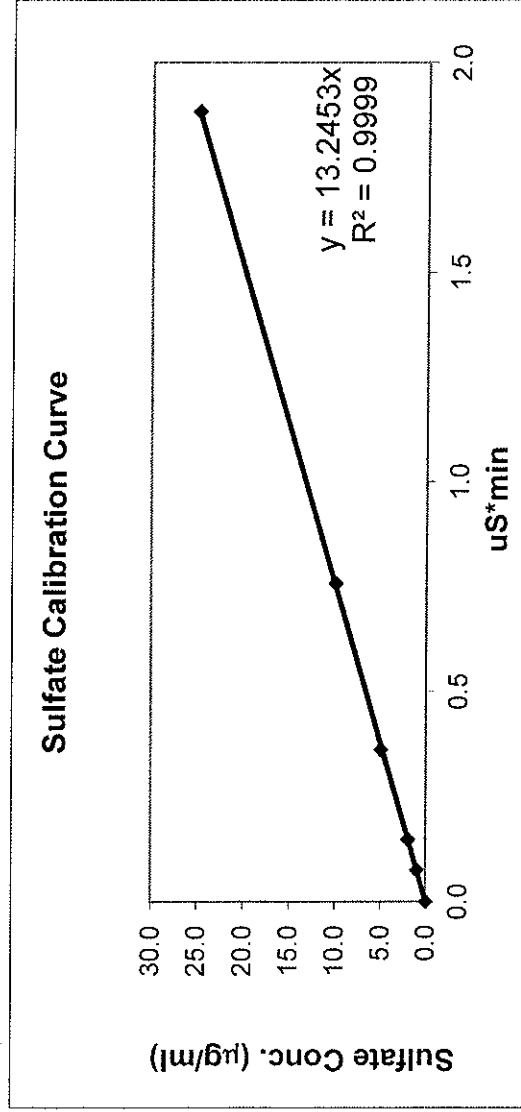
Identification	Total Partic (mg)	Mass NH <sub>4</sub> SO <sub>4</sub> (mg)	Corrected Partic (mg)
Run 1	22.20	2.77	19.43
Run 2	19.60	4.64	14.96
Run 3	10.60	3.57	7.03

CLIENT: BP  
 LOCATION: Whiting, IN  
 SOURCE: FCU 600  
 SAMPLE DATE: 12/10/2013  
 ANALYSIS: Particulates  
 METHOD: USEPA Method 5F

ANALYST: J. Ruggaber  
 DATE OF COMPLETION: 1/2/2014  
 TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3  
 PROJECT NUMBER: 08-606

Std. (µg/ml)	Pre Cal (µS*min)	Post Cal (µS*min)	Average (µS*min)	Deviation (%)	Conc (µg/ml)	Peak Area	RE	Cal Conc	% Dif
0.0	0.00	0.00	0.00	0.00	1.0	0.074	0.075	1.0	0.17
1	0.074	0.075	0.074	-0.47	2.0	0.148	0.074	2.0	-0.64
2	0.146	0.150	0.148	-1.42	5.0	0.361	0.072	4.8	-2.76
5	0.346	0.376	0.361	-4.16	10.0	0.757	0.076	10.2	1.89
10	0.736	0.778	0.757	-2.76	24.9	1.883	0.076	25.3	1.34
25	1.812	1.955	1.883	-3.80	mean RF----	0.0745			
					2nd std	0.3716	N/A	4.9	-1.46

CCVs			
Conc. (µg/ml)	Ini. #	Peak Area	% Diff
5.0	337	0.3766	4.22
			Pass





951 Old Rand Road # 106  
Wauconda, IL 60084



# ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
FCU 600

Lab Project #: 08-606  
Project Manager: Steve Flaherty  
Received: 12/17/2013  
Reported: 1/2/2014

Sample ID: FCU 600 Run 5F-1 Probe Wash  
Lab Sample #: 12483

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: FCU 600 Run 5F-1 Filter  
Lab Sample #: 12484

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Particulate	USEPA Method 5F	Joel Ruggaber	01/02/2014	19.43	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	01/02/2014	1996.7	ug	

Sample ID: FCU 600 Run 5F-2 Probe Wash  
Lab Sample #: 12485

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: FCU 600 Run 5F-2 Filter  
Lab Sample #: 12486

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Particulate	USEPA Method 5F	Joel Ruggaber	01/02/2014	14.96	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	01/02/2014	3337.8	ug	

Sample ID: FCU 600 Run 5F-3 Probe Wash  
Lab Sample #: 12487

Date Sampled: 12/10/2013

Field #:



951 Old Rand Road # 106  
Wauconda, IL 60084



## ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
FCU 600

Lab Project #: 08-606  
Project Manager: Steve Flaherty  
Received: 12/17/2013  
Reported: 1/2/2014

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: FCU 600 Run 5F-3 Filter  
Lab Sample #: 12488

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	01/02/2014	7.03	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	01/02/2014	2569.6	ug	

Sample ID: FCU 600 M5F DI Water Blank  
Lab Sample #: 12489

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
---------	--------	---------	---------------	--------	-------	-------

Sample ID: FCU 600 Filter Blank  
Lab Sample #: 12490

Date Sampled: 12/10/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	01/02/2014	2.30	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	01/02/2014	<90.1	ug	

Notes: UA - Not a NELAC accredited analyte under this method.

NA - Sample not tested for this analyte.

D - Value calculated from dilution.

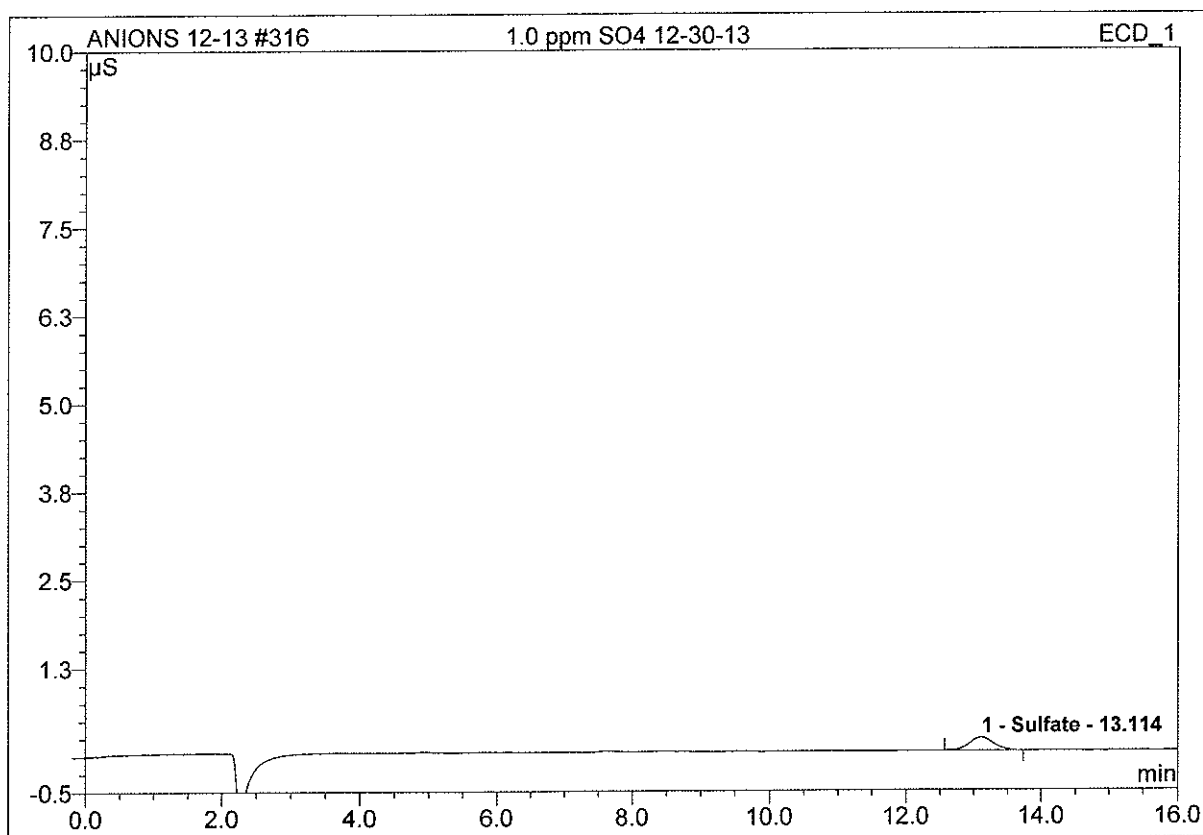
J - Value less than the low standard but above the Limit of Detection (LOD).

L - Sample leaked before receipt.

H - Value greater than the high standard.

**316 1.0 ppm SO4 12-30-13**

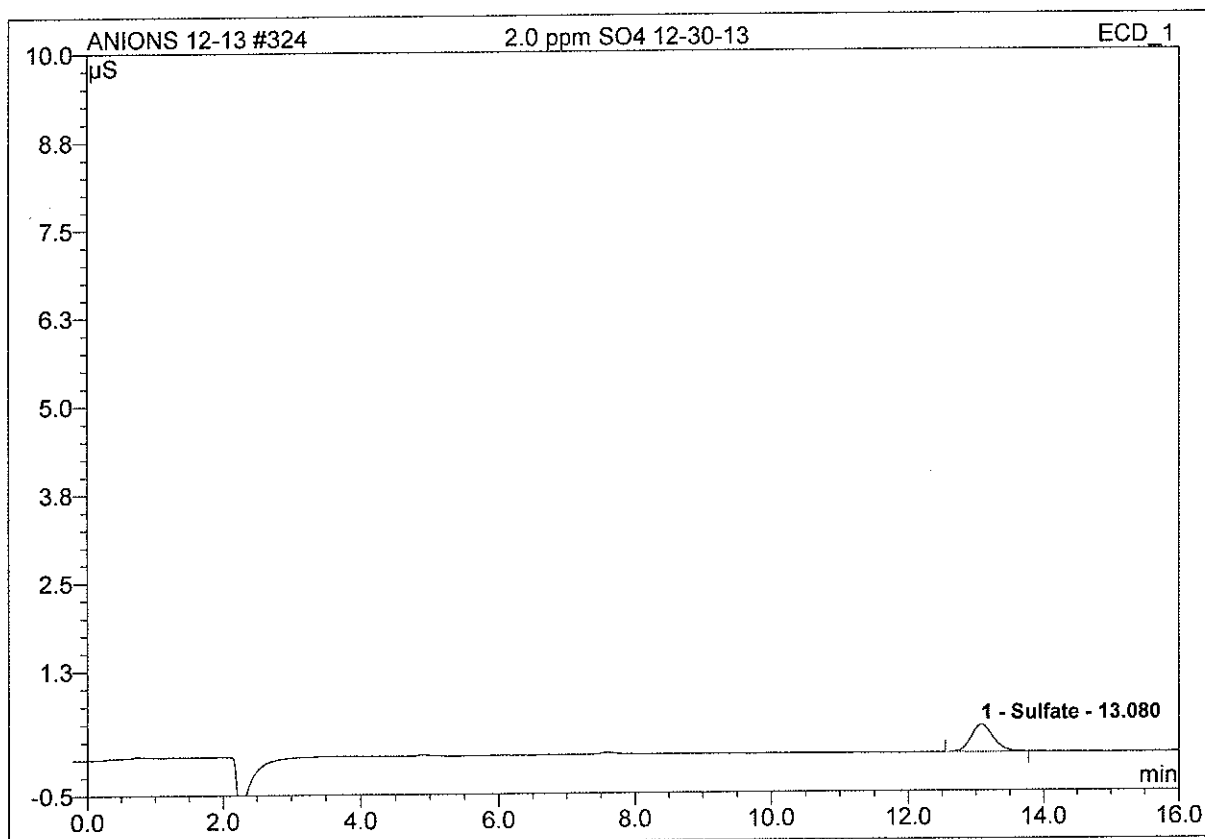
Client	BP	Injection Volume:	20.0
Vial Number:	406	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 10:53	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.11	Sulfate	0.181	0.0741

**324 2.0 ppm SO4 12-30-13**

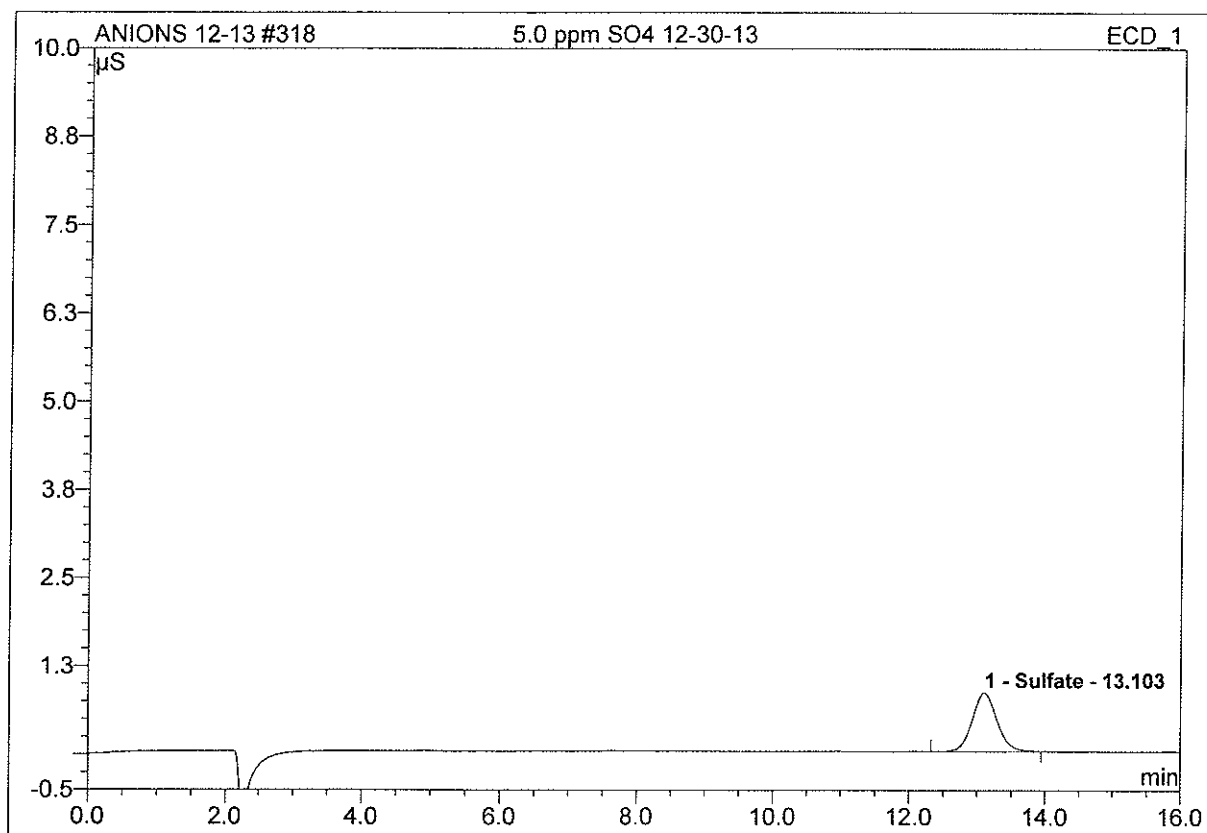
Client	BP	Injection Volume:	20.0
Vial Number:	415	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 13:26	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.08	Sulfate	0.384	0.1456

**318 5.0 ppm SO4 12-30-13**

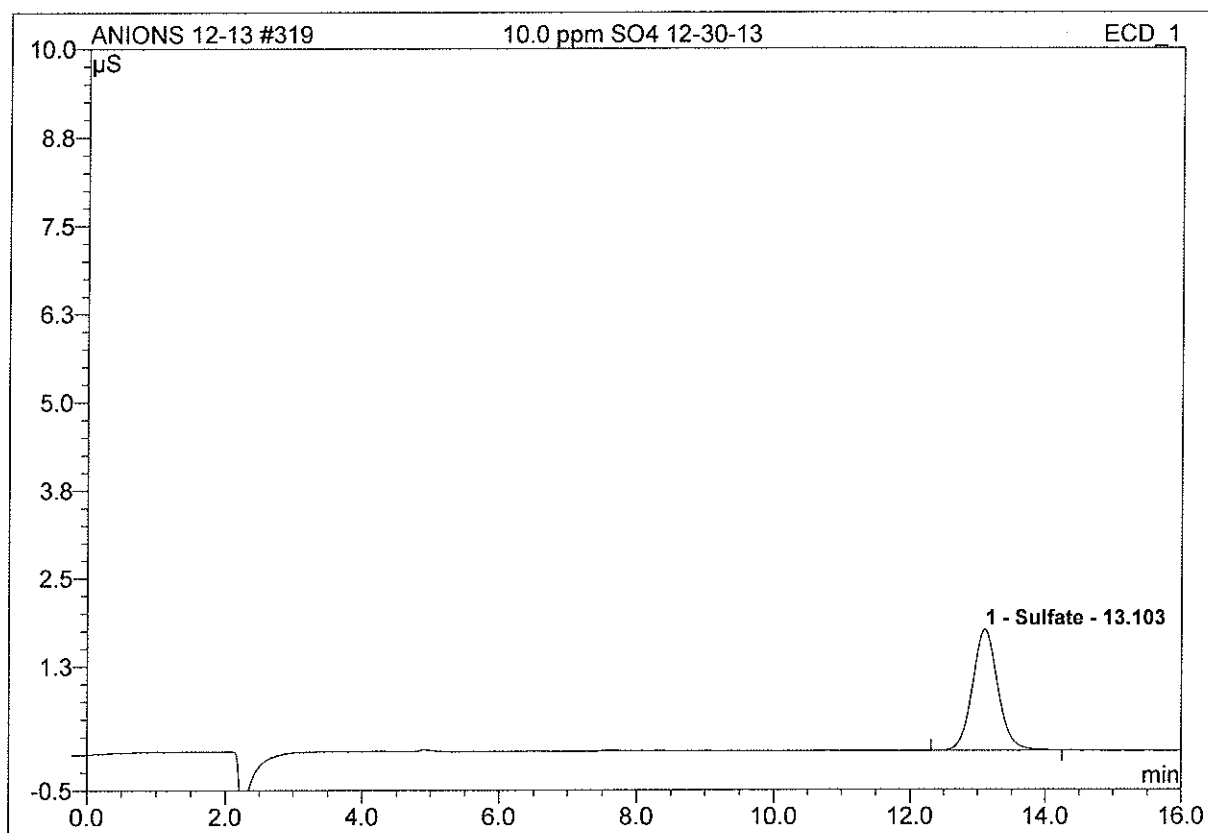
Client	BP	Injection Volume:	20.0
Vial Number:	408	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 11:29	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.10	Sulfate	0.831	0.3463

**319 10.0 ppm SO4 12-30-13**

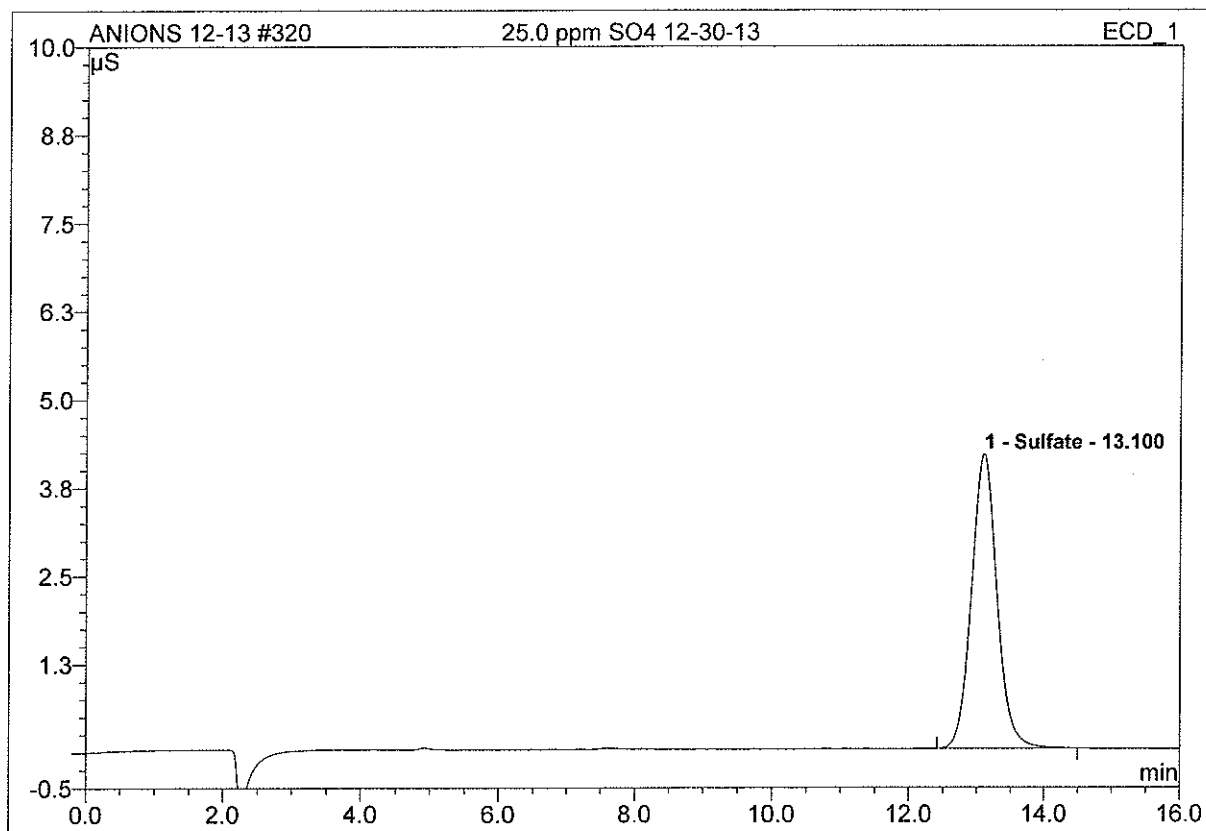
Client	BP	Injection Volume:	20.0
Vial Number:	409	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 11:47	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.10	Sulfate	1.712	0.7364

**320 25.0 ppm SO4 12-30-13**

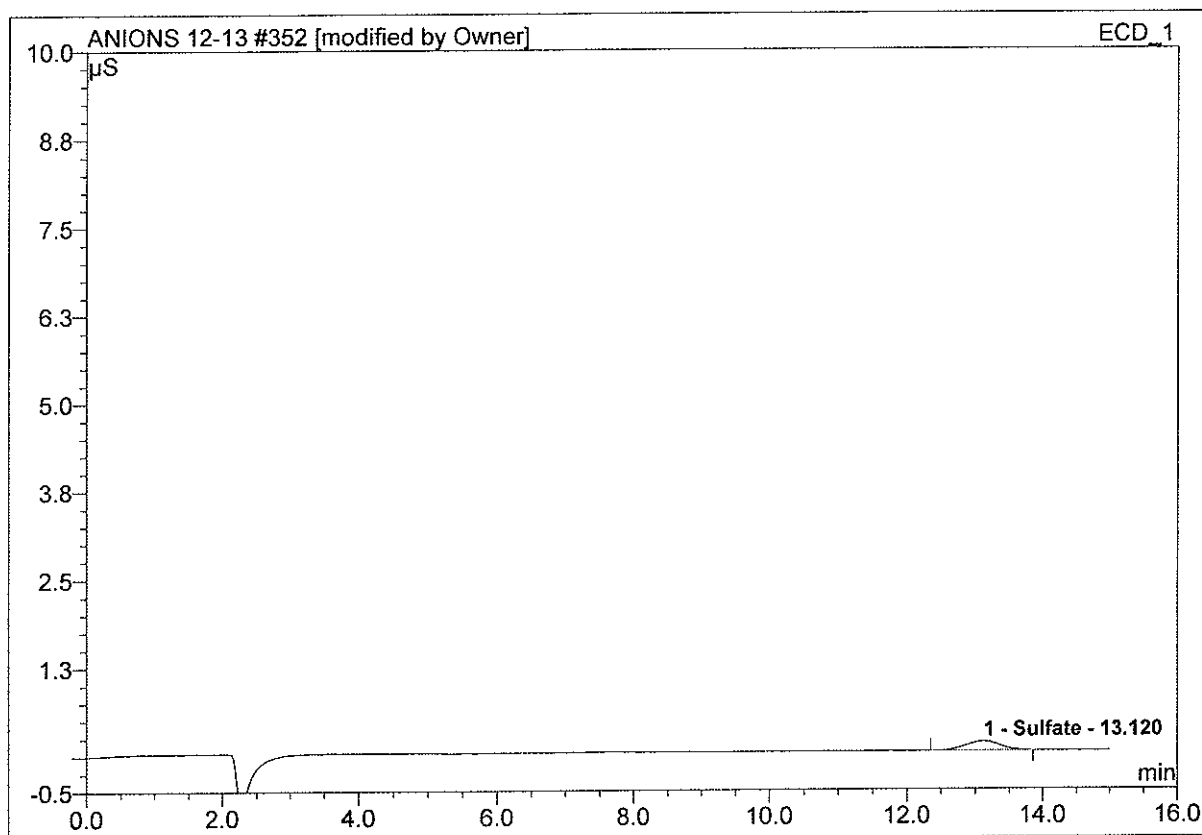
Client	BP	Injection Volume:	20.0
Vial Number:	410	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 12:05	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.10	Sulfate	4.177	1.8116

**352 1.0 ppm SO4 12-30-13**

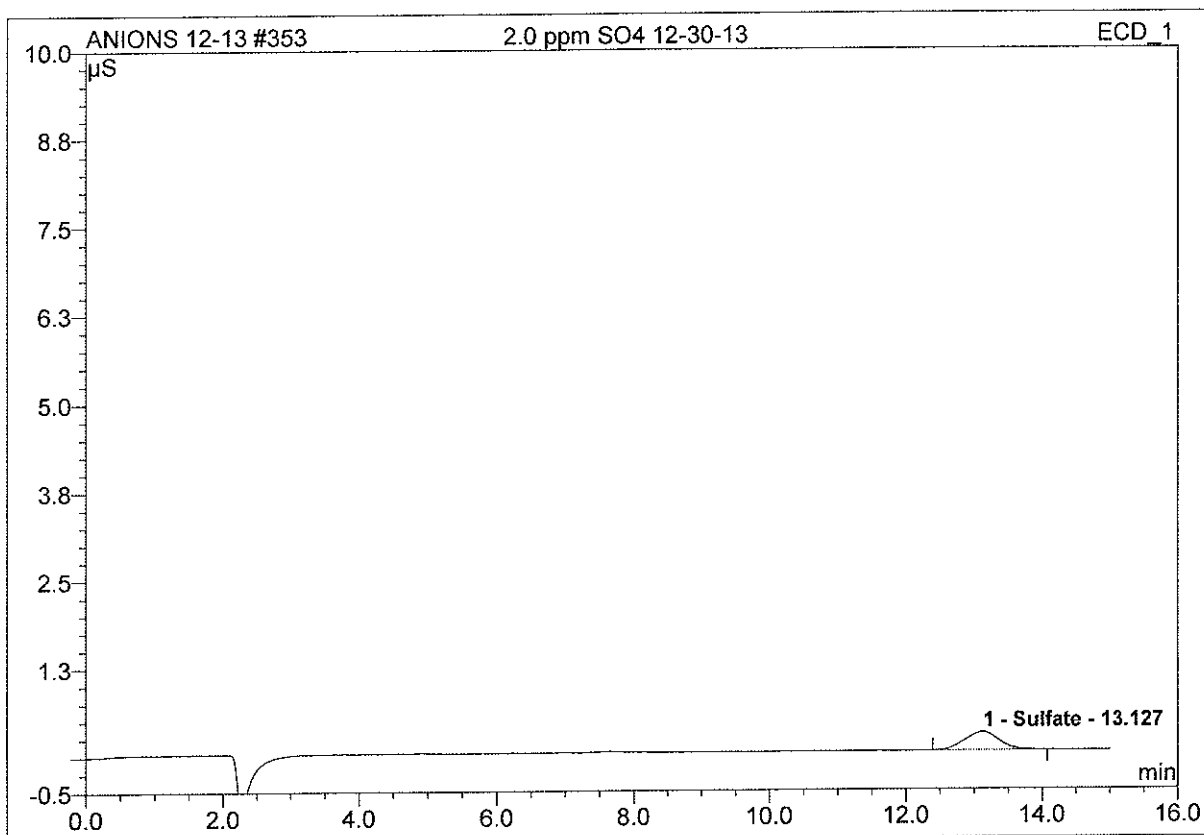
Client	BP	Injection Volume:	20.0
Vial Number:	443	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/31/2013 8:35	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.12	Sulfate	0.130	0.0748

**353 2.0 ppm SO4 12-30-13**

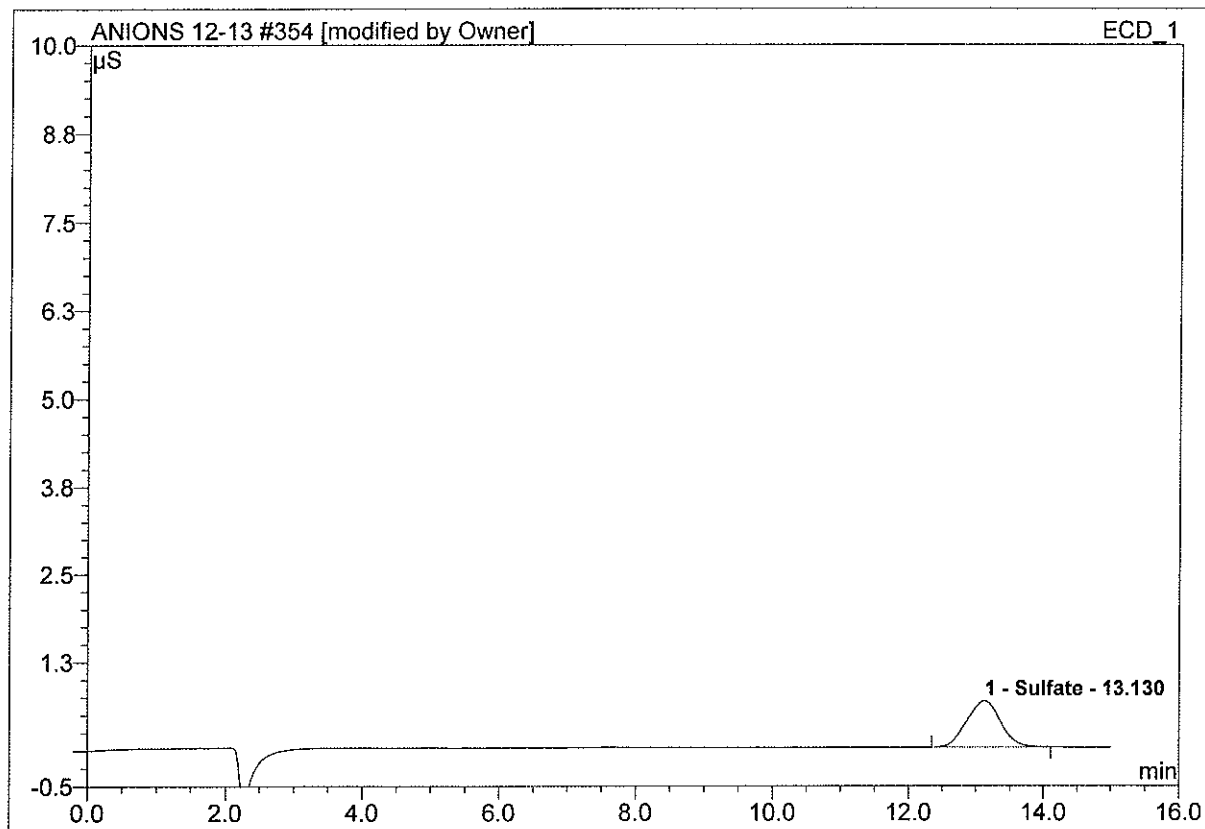
Client	BP	Injection Volume:	20.0
Vial Number:	444	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/31/2013 8:51	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.13	Sulfate	0.256	0.1498

**354 5.0 ppm SO4 12-30-13**

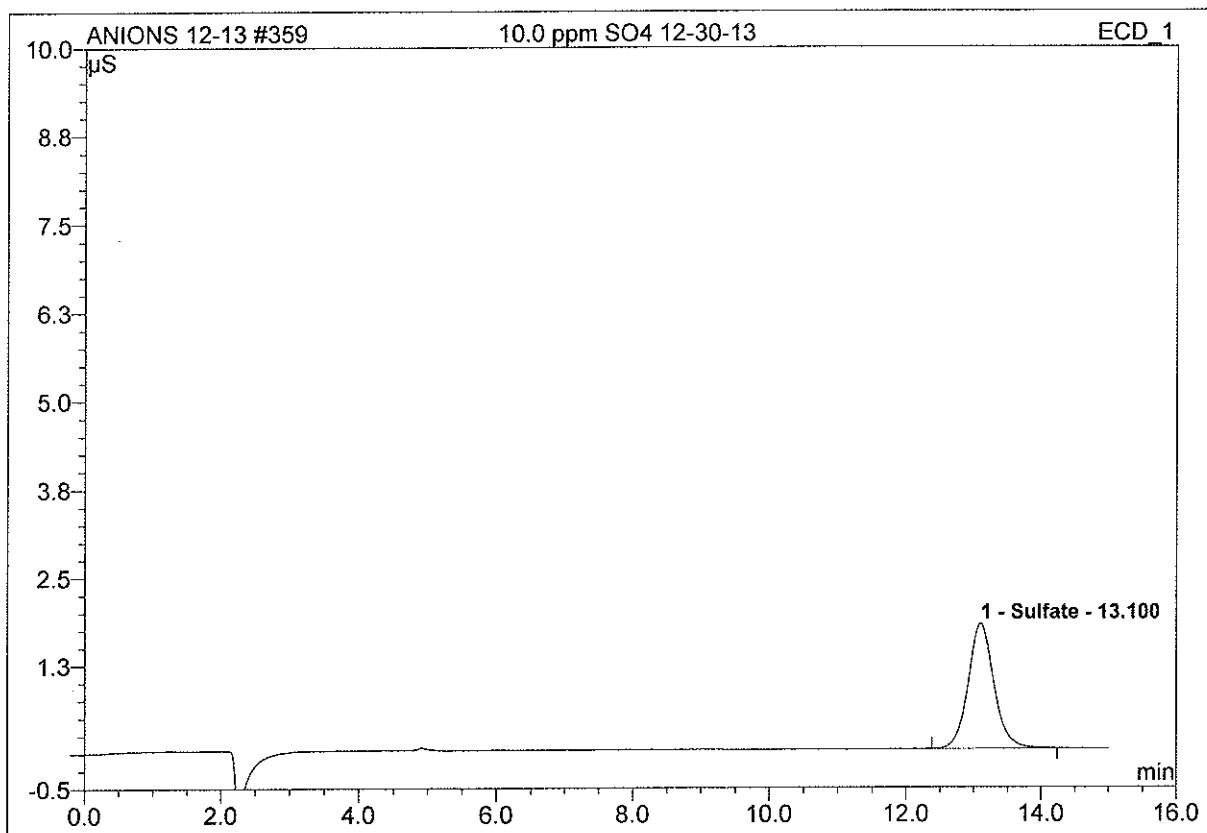
Client	BP	Injection Volume:	20.0
Vial Number:	445	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/31/2013 9:07	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.13	Sulfate	0.656	0.3764

**359 10.0 ppm SO4 12-30-13**

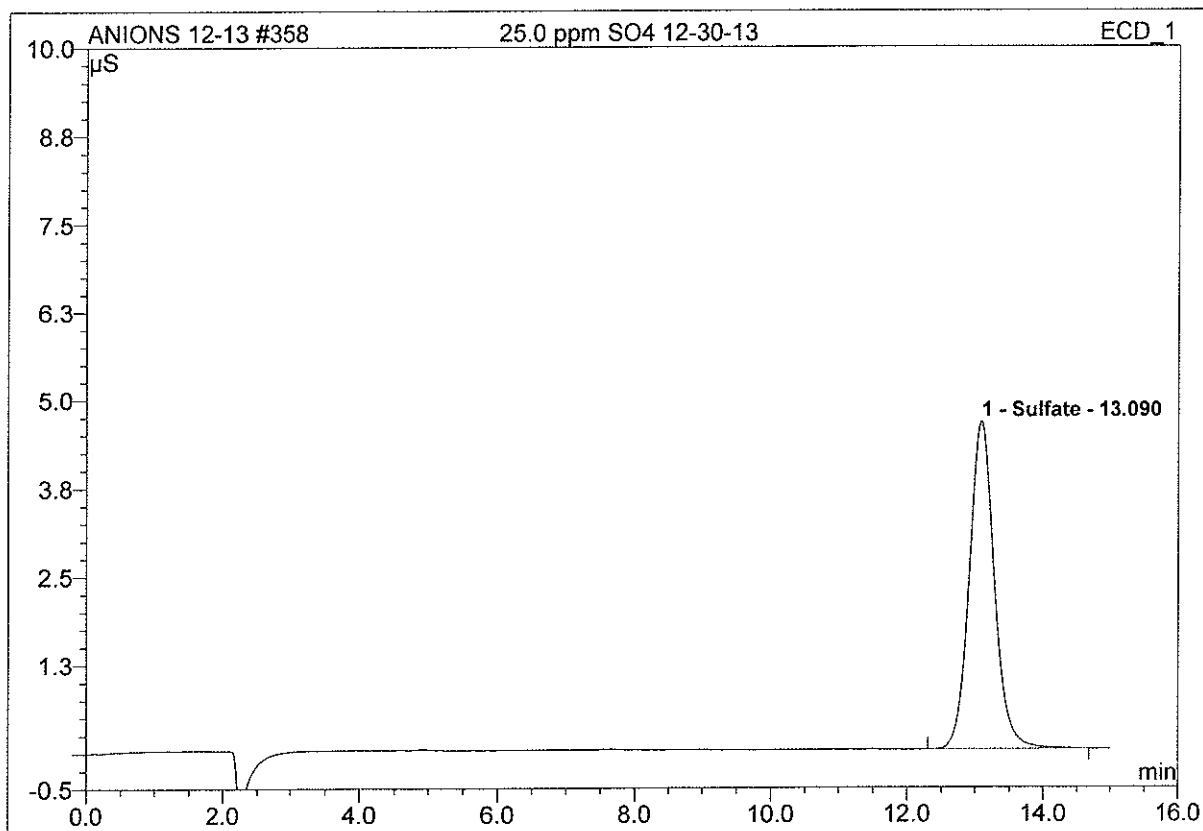
Client	BP	Injection Volume:	20.0
Vial Number:	450	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/31/2013 10:54	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.10	Sulfate	1.773	0.7782

**358 25.0 ppm SO4 12-30-13**

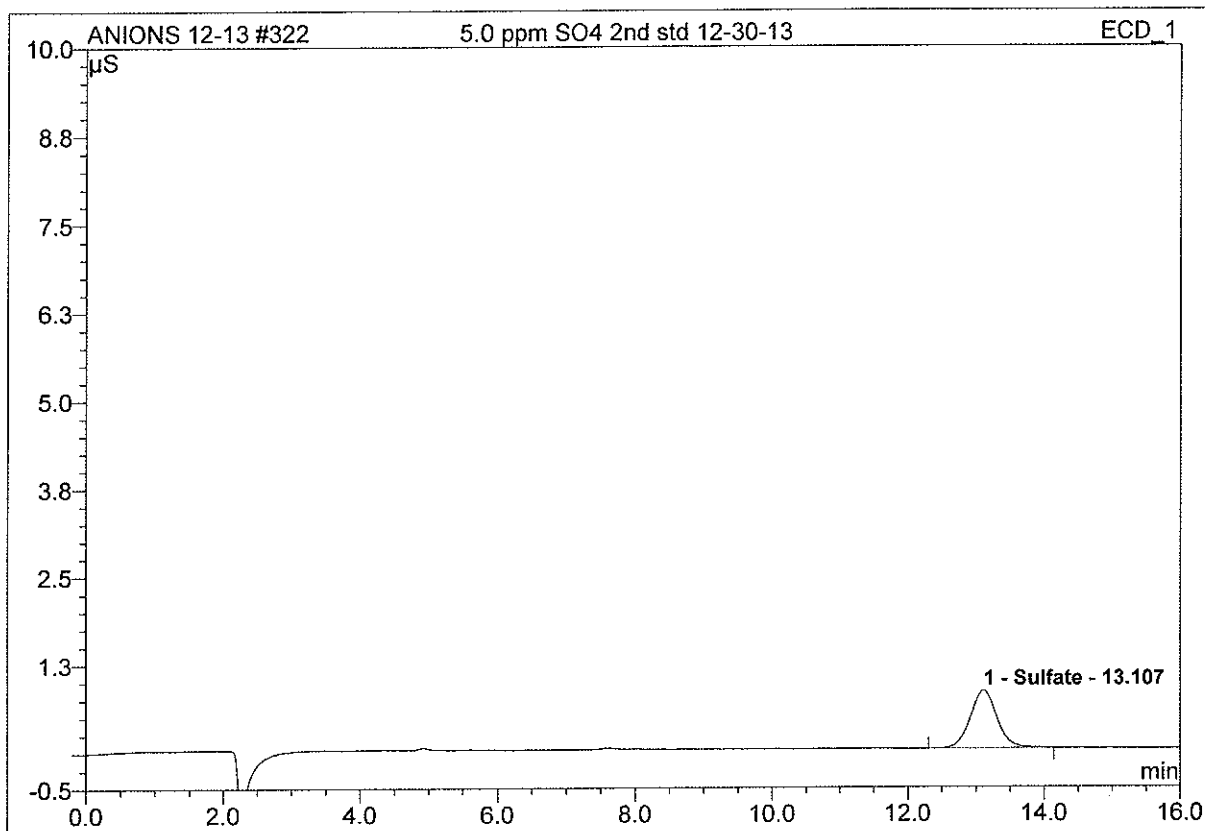
Client	BP	Injection Volume:	20.0
Vial Number:	449	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/31/2013 10:20	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height μS	Area μS*min
1	13.09	Sulfate	4.638	1.9546

**322 5.0 ppm SO4 2nd std 12-30-13**

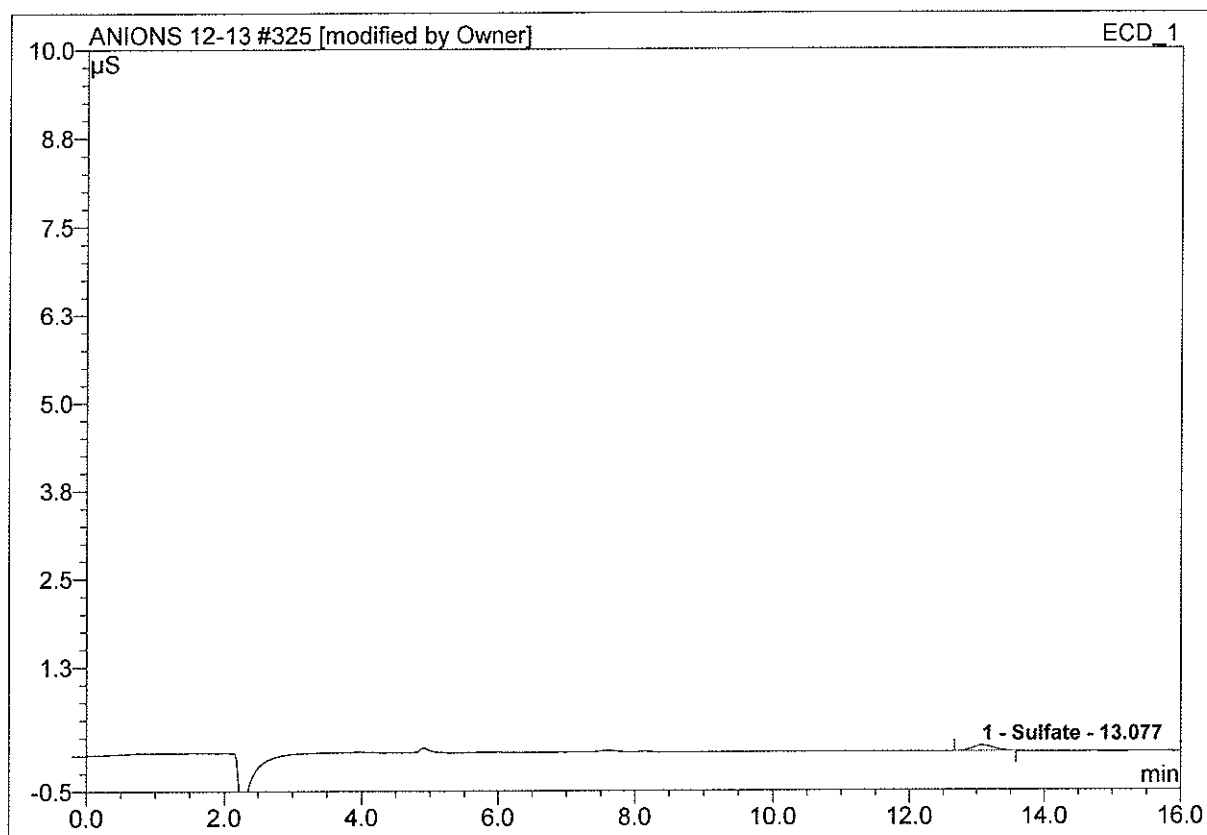
Client	BP	Injection Volume:	20.0
Vial Number:	413	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 12:43	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.11	Sulfate	0.818	0.3716

**325 M5F-1 #12483/12484**

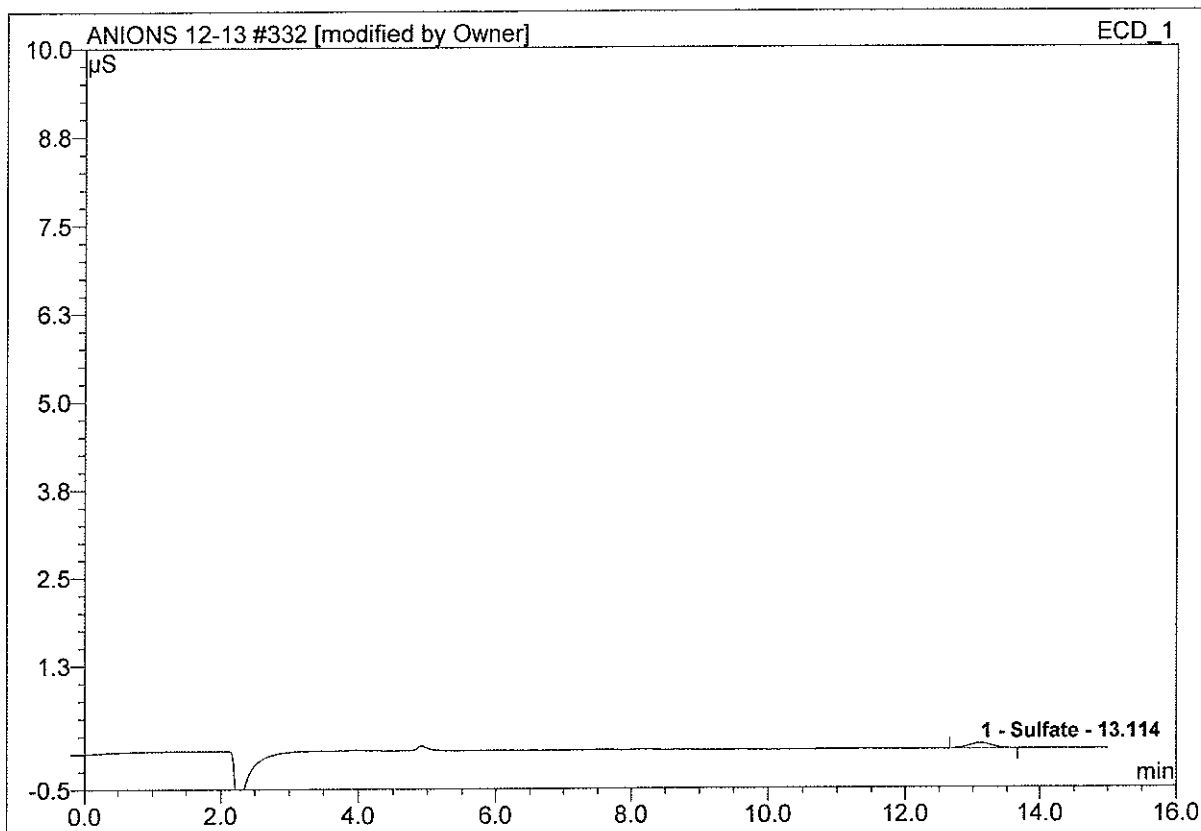
Client	BP	Injection Volume:	20.0
Vial Number:	416	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 13:50	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.08	Sulfate	0.081	0.0307

**332 M5F-1 #12483/12484**

Client	BP	Injection Volume:	20.0
Vial Number:	423	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 15:56	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000

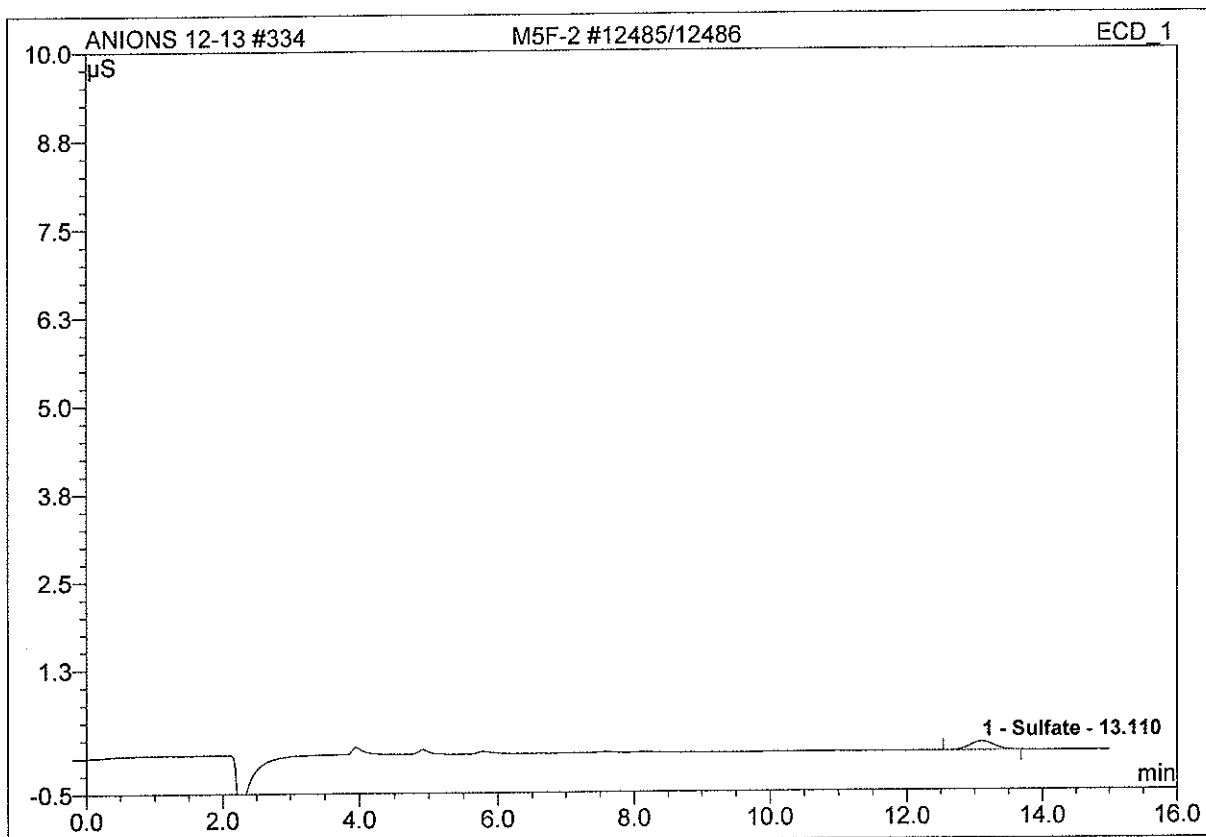


No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.11	Sulfate	0.075	0.0296

**334 M5F-2 #12485/12486**

Client **BP**  
Vial Number: **425**  
Sample Type: **unknown**  
Control Program: **Anions 1000**  
Quantif. Method: **ICS\_1000\_Anions**  
Recording Time: **12/30/2013 16:28**  
Run Time (min): **12.00**

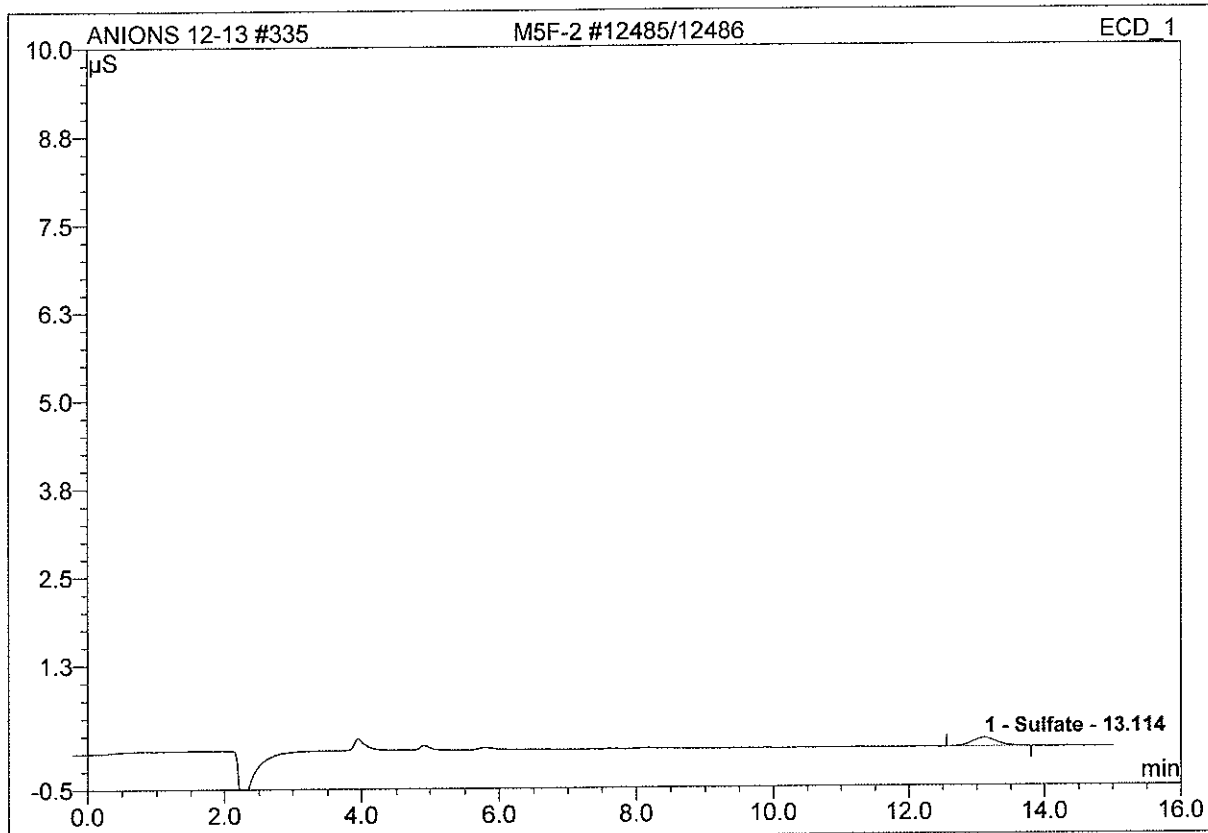
Injection Volume: **20.0**  
Channel: **ECD\_1**  
Wavelength: **n.a.**  
Bandwidth: **n.a.**  
Dilution Factor: **1.0000**  
Sample Weight: **1.0000**  
Sample Amount: **1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.11	Sulfate	0.122	0.0506

**335 M5F-2 #12485/12486**

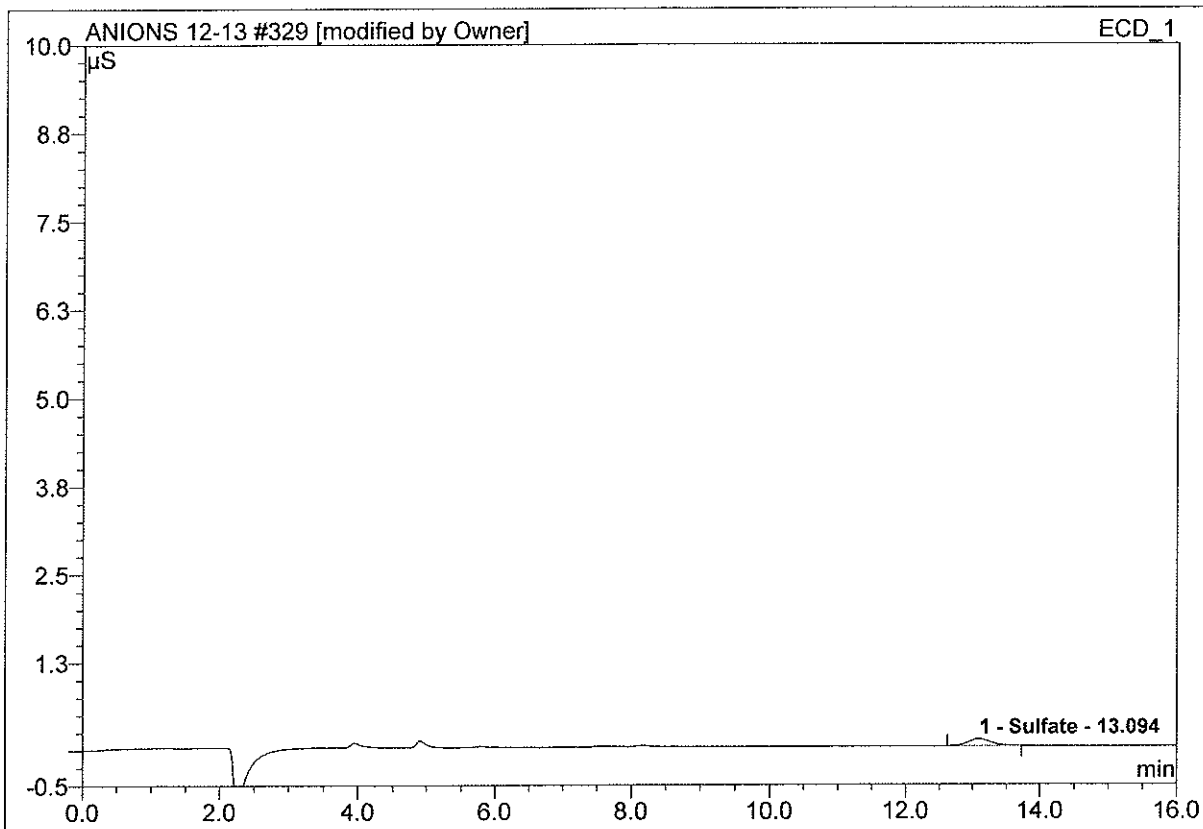
Client	BP	Injection Volume:	20.0
Vial Number:	426	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 16:47	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.11	Sulfate	0.120	0.0502

**329 M5F-3 #12487/12488**

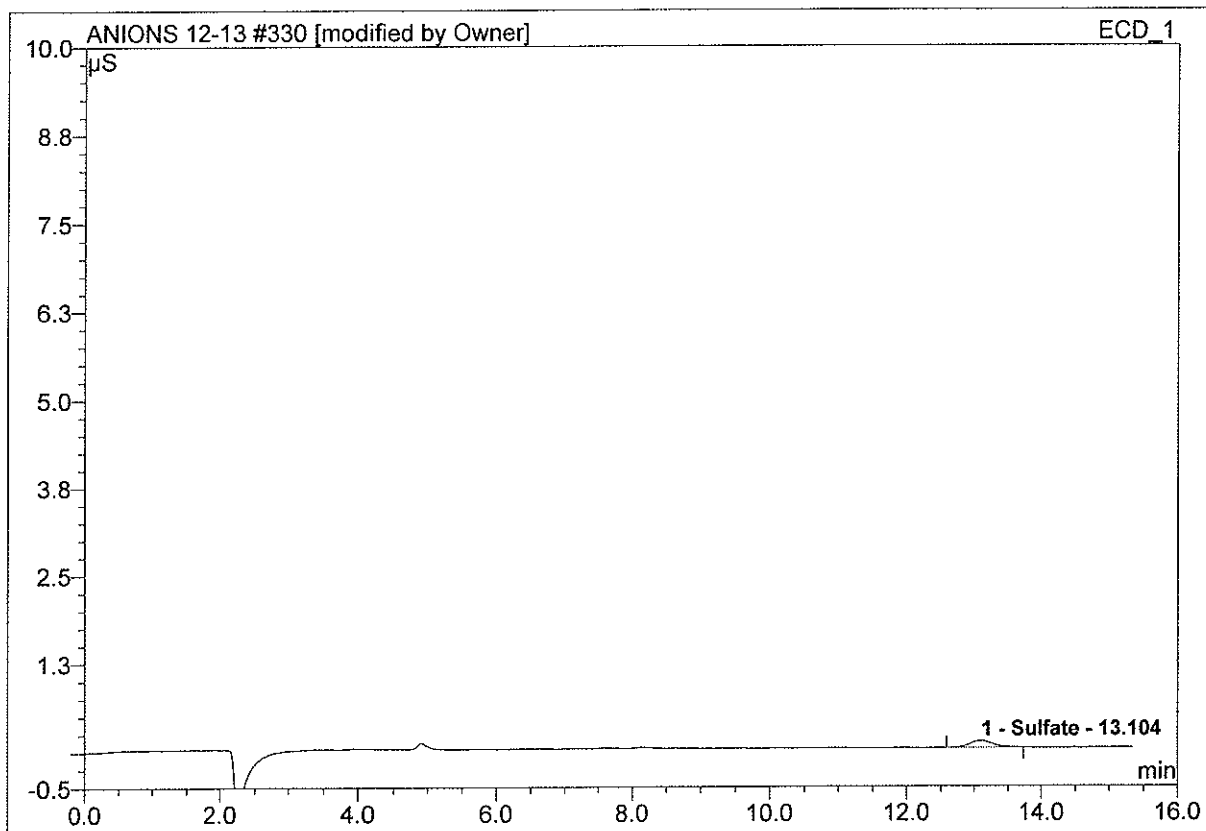
Client	BP	Injection Volume:	20.0
Vial Number:	420	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 15:05	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.09	Sulfate	0.099	0.0389

**330 M5F-3 #12487/12488**

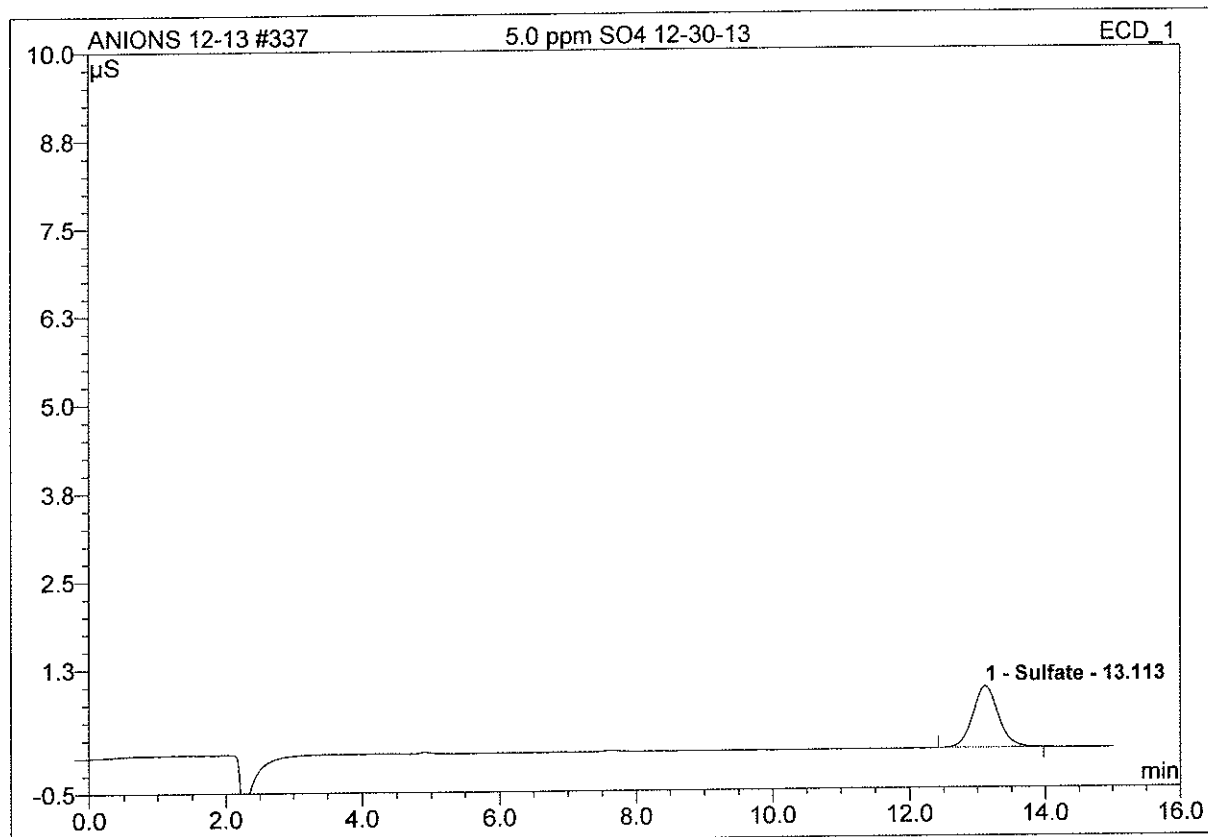
Client	BP	Injection Volume:	20.0
Vial Number:	421	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 15:23	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height μS	Area μS*min
1	13.10	Sulfate	0.095	0.0387

**337 5.0 ppm SO4 12-30-13**

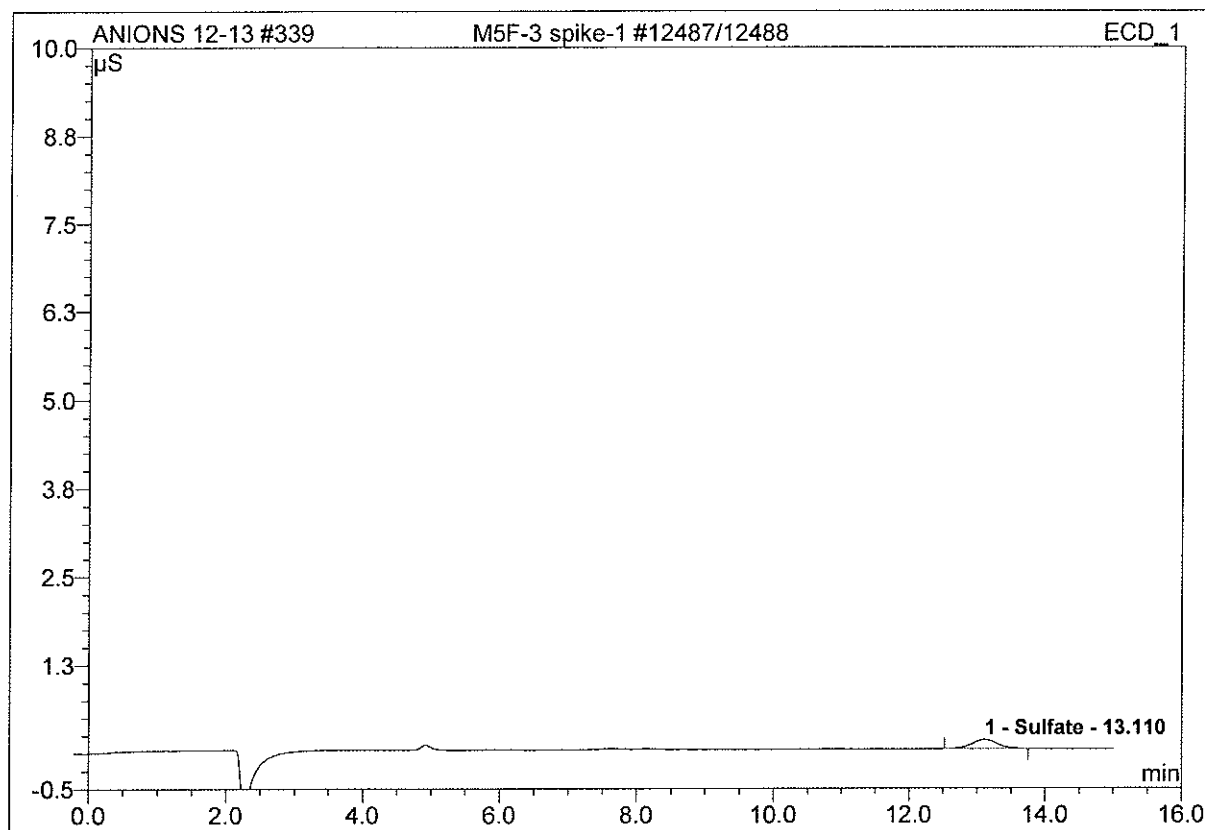
Client	BP	Injection Volume:	20.0
Vial Number:	428	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 17:19	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height μS	Area μS*min
1	13.11	Sulfate	0.872	0.3766

**339 M5F-3 spike-1 #12487/12488**

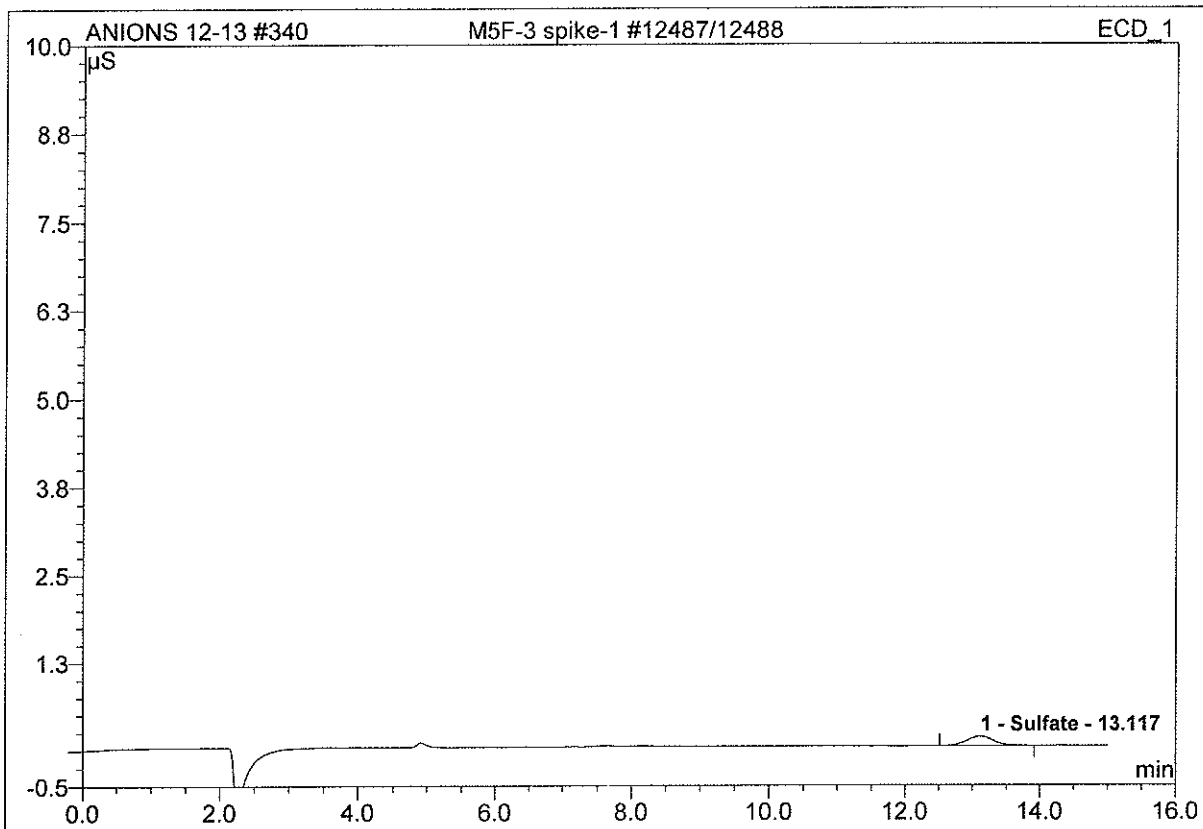
Client	BP	Injection Volume:	20.0
Vial Number:	430	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 17:51	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.11	Sulfate	0.132	0.0580

**340 M5F-3 spike-1 #12487/12488**

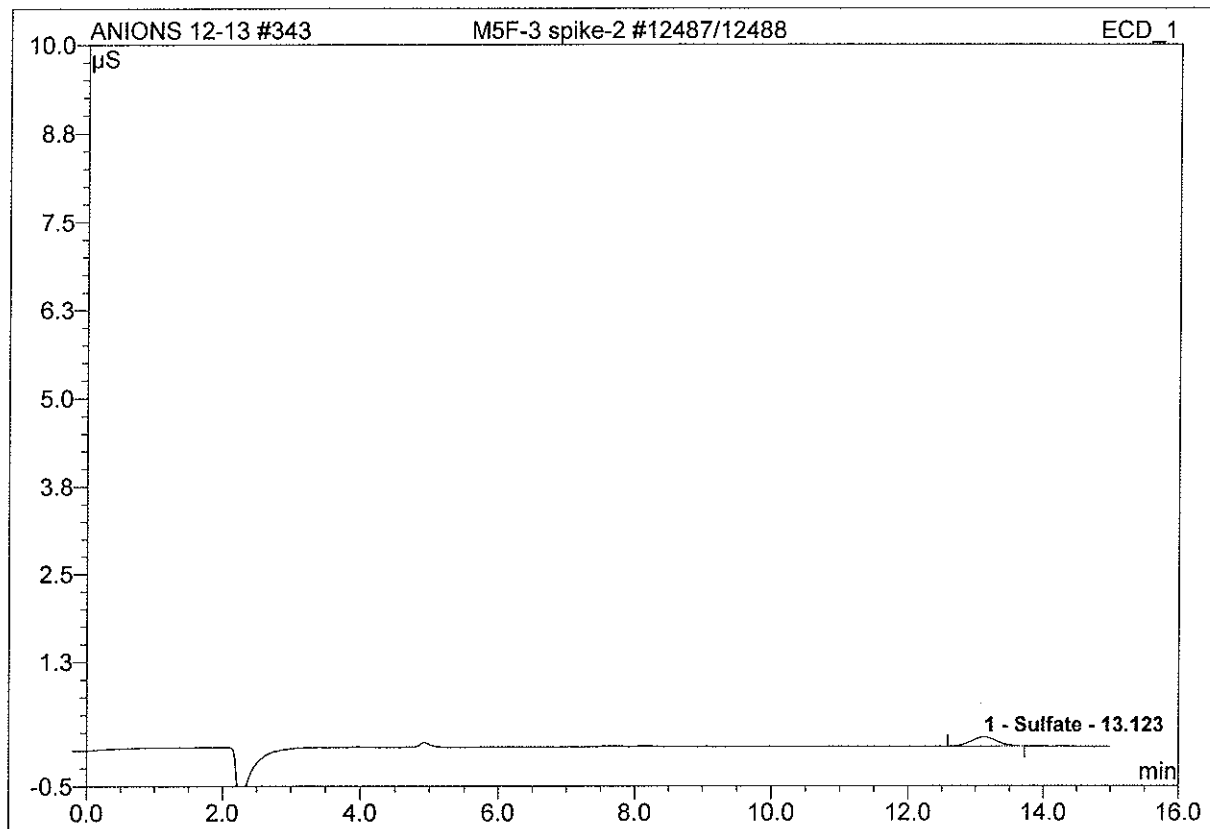
Client	BP	Injection Volume:	20.0
Vial Number:	431	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 18:08	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
1	13.12	Sulfate	0.133	0.0610

**343 M5F-3 spike-2 #12487/12488**

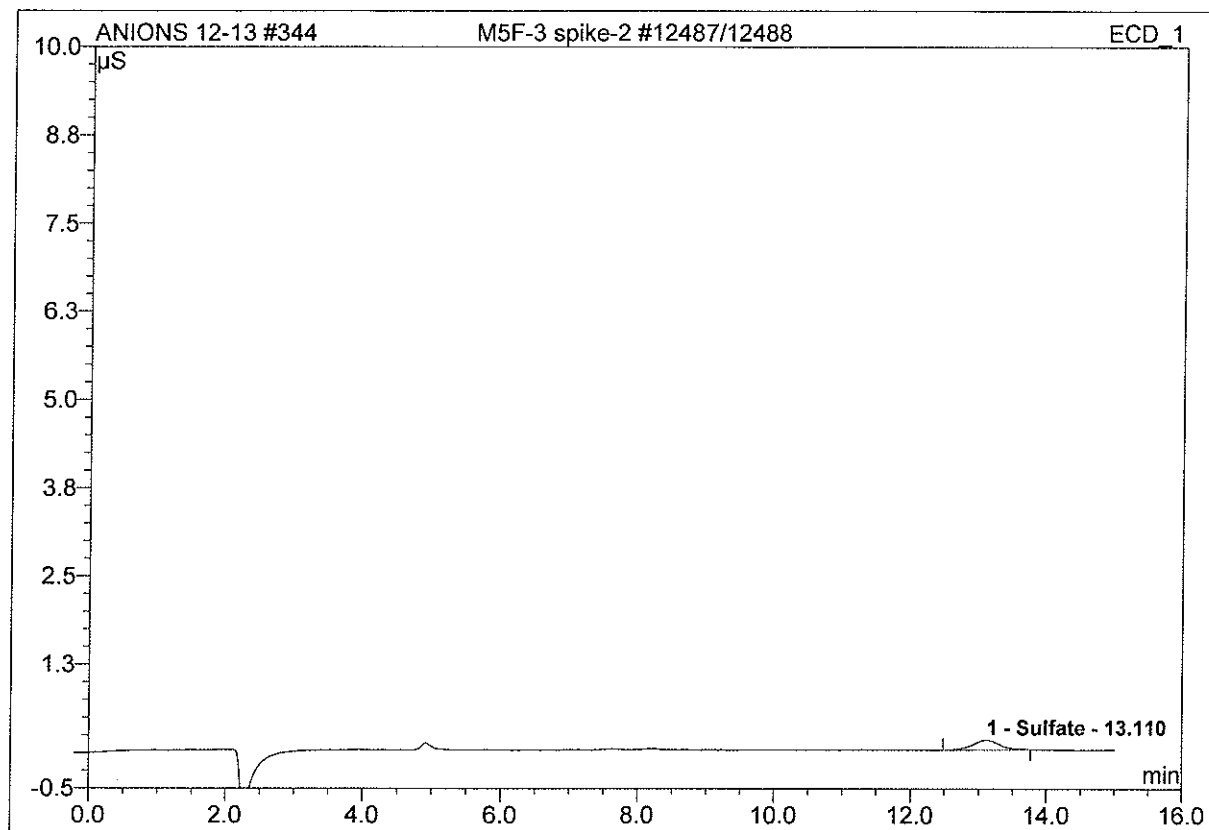
Client	BP	Injection Volume:	20.0
Vial Number:	434	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 18:56	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.12	Sulfate	0.130	0.0565

**344 M5F-3 spike-2 #12487/12488**

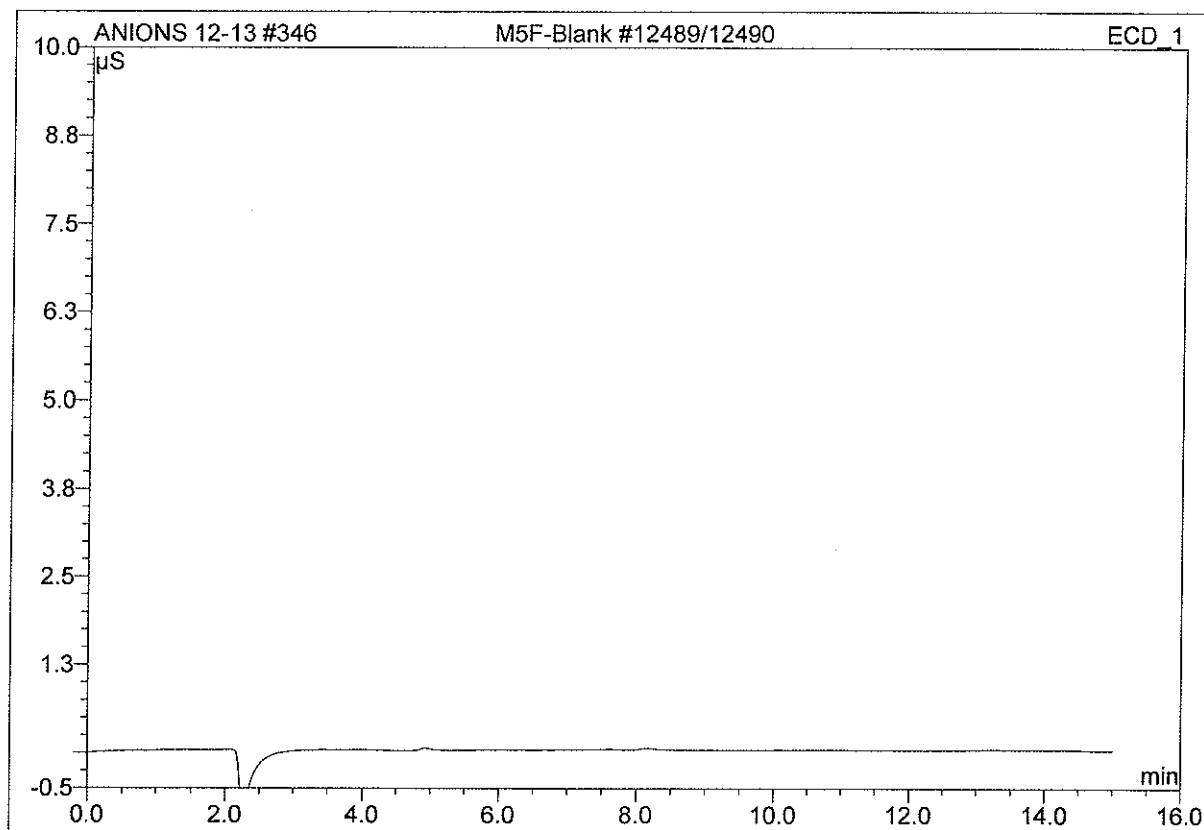
Client	BP	Injection Volume:	20.0
Vial Number:	435	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 19:12	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	13.11	Sulfate	0.135	0.0600

**346 M5F-Blank #12489/12490**

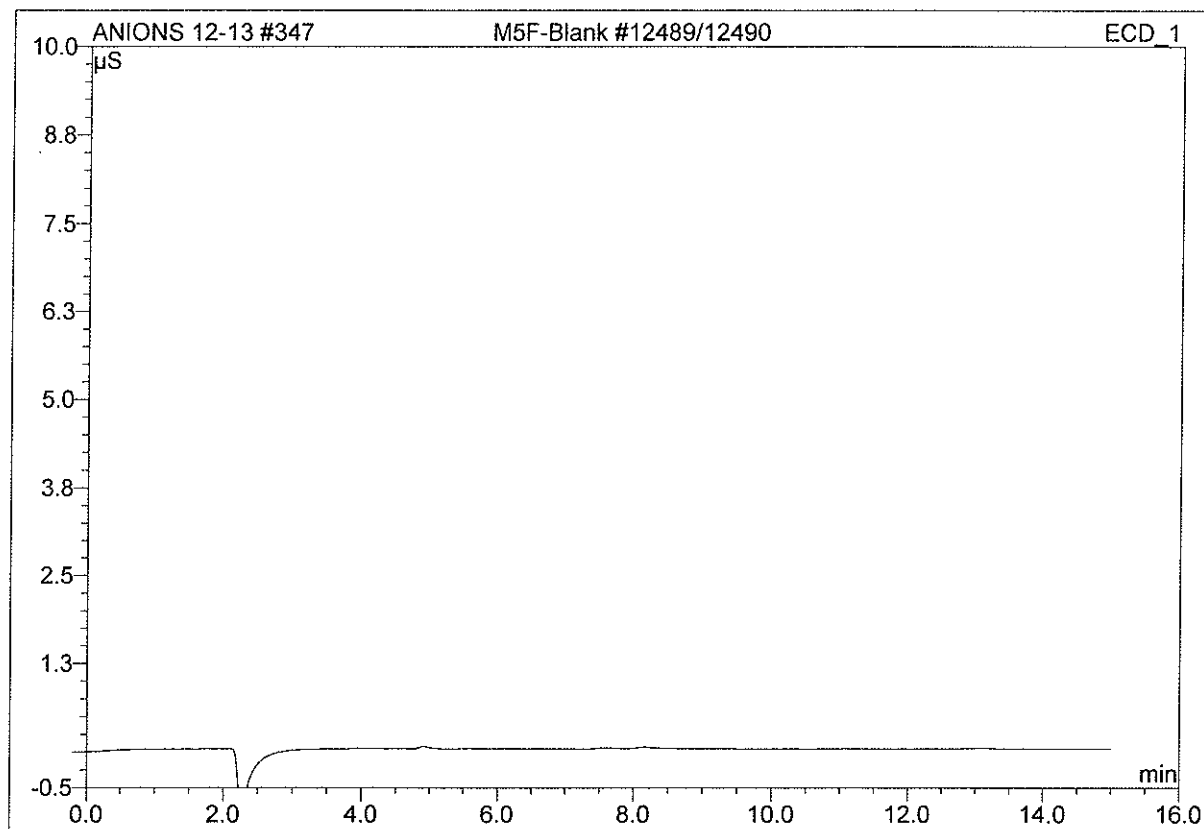
Client	BP	Injection Volume:	20.0
Vial Number:	437	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 19:44	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
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**347 M5F-Blank #12489/12490**

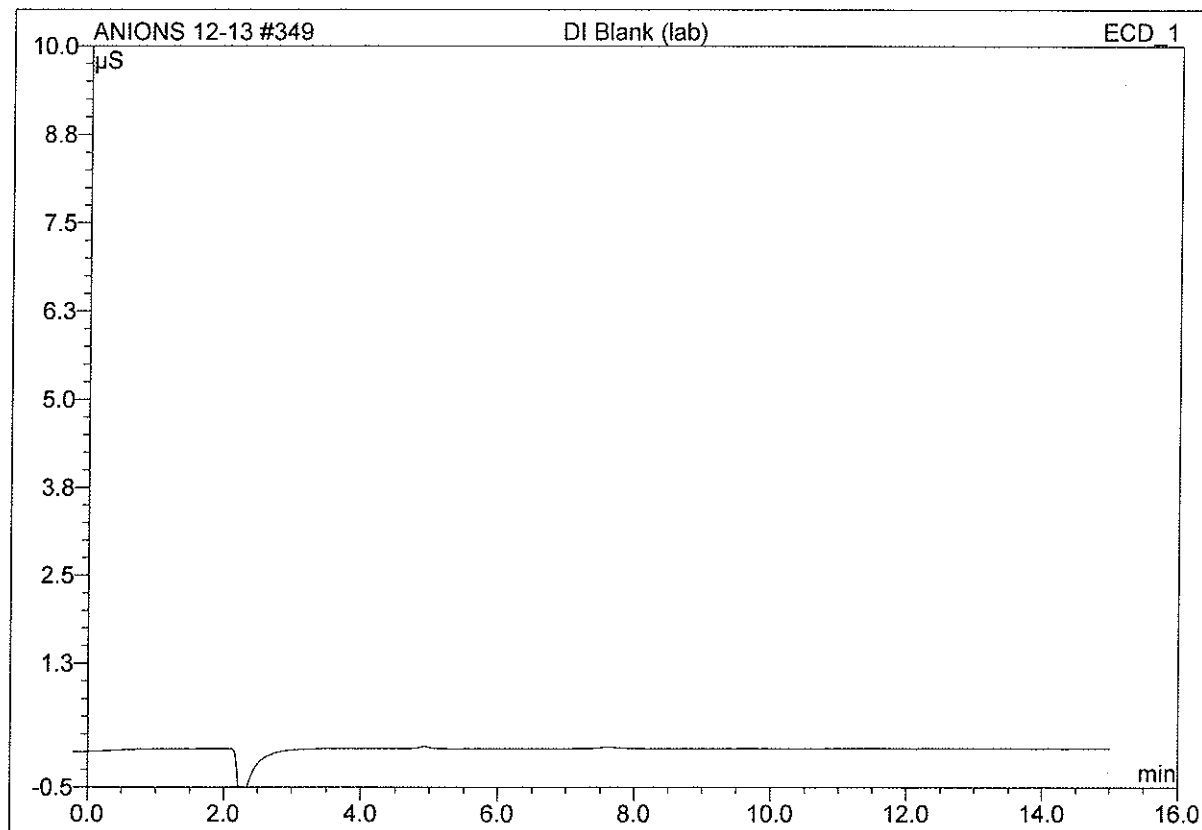
Client	BP	Injection Volume:	20.0
Vial Number:	438	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 20:00	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
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**349 DI Blank (lab)**

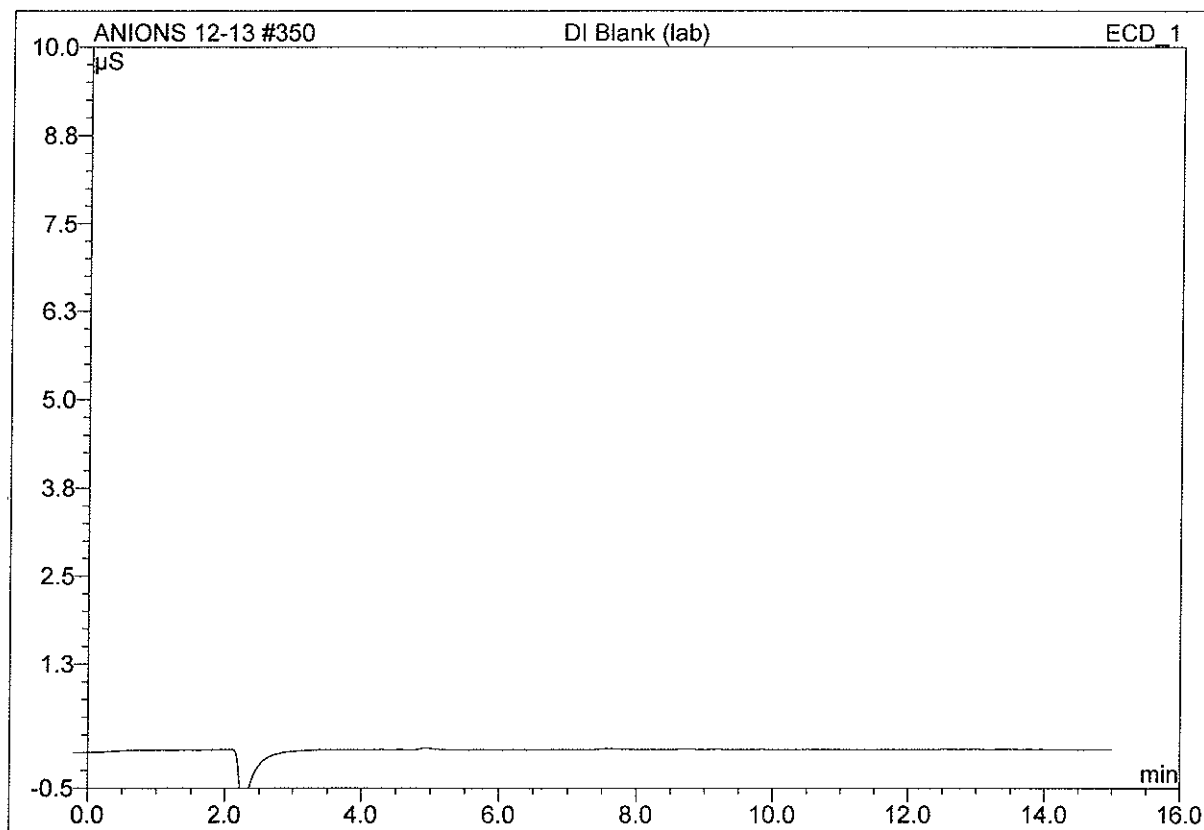
Client	BP	Injection Volume:	20.0
Vial Number:	440	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 20:33	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
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**350 DI Blank (lab)**

Client	BP	Injection Volume:	20.0
Vial Number:	441	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	Anions 1000	Bandwidth:	n.a.
Quantif. Method:	ICS_1000_Anions	Dilution Factor:	1.0000
Recording Time:	12/30/2013 20:49	Sample Weight:	1.0000
Run Time (min):	12.00	Sample Amount:	1.0000



No.	Ret. Time min	Peak Name	Height µS	Area µS*min
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**USEPA METHOD 5F TASK SCHEDULE FORM**

Document Number: WL-M5FTASK-FORM-026A

Revision Number: 1

Effective Date: 11/15/10

**USEPA METHOD 5F TASK SCHEDULE**

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 12/10/13

Lab Project #: 08-606

Spreadsheet Template ID: USEPA-M5F-Partic-Template-61T-REV3

Analyst: J. Ruggaber + E. Vogt

**Eluent**Sodium Carbonate ( $\text{Na}_2\text{CO}_3$ ) manufacturer and lot: Fisher, Lot 095351

Batch Number	Amount weighed/2L	Date/Time Prepared
1	1.6965 g	12/30/13, 8:56
2	g	
3	g	

Sodium Bicarbonate ( $\text{NaHCO}_3$ ) manufacturer and lot: Fisher, Lot 110567

Batch Number	Amount weighed/2L	Date/Time Prepared
1	0.1680 g	12/30/13, 8:56
2	g	
3	g	

**Reagents**

Phenolphthalein Solution: WL-LOG#4-Log-037A page 46

Ammonium Hydroxide: 0.0992 N, lot SHBC0698V, Fluka



# USEPA METHOD 5F TASK SCHEDULE FORM

Document Number: WL-M5FTASK-FORM-026A

Revision Number: 1

Effective Date: 11/15/10

## Standard Identification

1) 1.0 ppm SO<sub>4</sub> 12-30-13

2) 2.0 ppm SO<sub>4</sub> 12-30-13

3) 5.0 ppm SO<sub>4</sub> 12-30-13

4) 10.0 ppm SO<sub>4</sub> 12-30-13

5) 25.0 ppm SO<sub>4</sub> 12-30-13

Secondary standard solution 5.0 ppm SO<sub>4</sub> 12-30-13

DATE/TIME	EQUIPMENT	TASK
N/A	N/A	If not already performed in the field, remove the filter from the filter holder and place into a Petri dish.
12/18/13	N/A	Cut the filter into small pieces, and transfer to a 250 mL beaker.
12/18/13	N/A	Rinse the Petri dish with water, and transfer the wash to the beaker. Add additional water to approximately 75 mL.
12/18/13	N/A	Reflux on a hot plate for 6-8 hours.
12/18/13	N/A	Cool the flasks, and transfer contents, including particulate and filter pieces, to a 500 mL (or 1000 mL, if needed) volumetric flask.
12/18/13	N/A	Add the probe wash (with rinse) to the volumetric flask. Dilute to volume with water. Repeat for all samples and blanks.
12/18/13	N/A	After solids settle, volumetrically dilute 5 mL to 50 mL with water. Save for sulfate analysis.
12/17/13, 16:00	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs).
12/19/13, 9:29	Balance #1	Weigh conditioned beakers and record tares.
12/19/13 – 12/20/13	Oven #1	Evaporate the contents of the volumetric flasks (and rinses) in tared beakers using a 105 °C oven to about 100 mL.
12/20/13	N/A	Remove the beakers from the oven and cool.
12/20/13	N/A	Add approximately 5 drops of phenolphthalein to each beaker. Add concentrated ammonium hydroxide dropwise until the solution turns pink.
12/20/13	Oven #1	Return the beakers to the oven and evaporate to dryness.
12/20/13 16:00	Desiccator #1	Place beakers in desiccator (store min. 24 hours)
12/24/13 9:14	Balance #1	Beaker weighing #1



# USEPA METHOD 5F TASK SCHEDULE FORM

Document Number: WL-M5FTASK-FORM-026A

Revision Number: 1

Effective Date: 11/15/10

12/26/13 10:20	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
12/26/13 16:45	N/A	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
12/30/13	ICS 1000 Anions	Equilibrate the IC instrument
12/30/13	ICS 1000 Anions	Inject each of the 5 standard solutions once. Plot the standard injection areas against sulfate concentrations to determine an initial calibration curve.
12/30/13	ICS 1000 Anions	Inject secondary standard once. Check that the secondary standard is within 15% of the initial calibration curve.
12/30/13 – 12/31/13	ICS 1000 Anions	Inject each sample solution in duplicate. Check that the sulfate area count for each duplicate injection is within 5% of the mean.
N/A	N/A	If necessary, dilute sample solutions and re-inject.
12/30/13 – 12/31/13	N/A	Inject the midpoint standard once after every 20 sample injections. Check that the standard is within 15% of the initial calibration curve.
12/31/13	ICS 1000 Anions	Inject each standard solution once at the end of the run.
12/31/13	ICS 1000 Anions	Determine a final calibration curve.
1/2/14	ICS 1000 Anions	Determine the concentrations of each sample using the final calibration curve.
1/2/14	ICS 1000 Anions	Prepare report
		Report QA review
		Report distribution



951 Old Rand Road, Unit 106  
Wauconda, Illinois 60084



1710 Preston Road, Unit C  
Pasadena, Texas 77503

## SAMPLE RECEIPT CHECKLIST

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 12/10/13

Chain-of-Custody Number(s): W02288

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Preservation code noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Project information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Sample information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Analysis request clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Report tier level noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Sample Containers:

Quantity of samples match number on COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Container label ID numbers and descriptions match COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All containers received in good condition	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Liquid levels at marked heights on containers	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All container labels are legible	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All sample IDs are unique	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received in correct type of container	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received within the required holding time	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received under the required preservation code	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met.

Samples Received by:

Eric Voegt  
Printed Name

Eric Voegt  
Signature

Date and Time Received: 12/16/13 9:00



Chain of Custody Record Number: W02258

[illegible]



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## **APPENDIX D**

## **Calibration Data**

---

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647 cc/in Hg

Calibration Conditions		
Date	Time	
Barometric Pressure		11-Dec-12 2:30
Theoretical Critical Vacuum <sup>1</sup>		29.3 in Hg
Calibration Technician		13.8 in Hg
		B. Crane

For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.  
The Critical Orifice Coefficient,  $K'$ , must be entered in English units,  $(ft^3 \cdot g^{1/2}) / (in \cdot Hg \cdot min)$ .

Run Time		Calibration Data									
Elapsed ( $t_e$ ) min	DGM Office $\Delta H$ ( $P_m$ ) in H <sub>2</sub> O	Metering Console				Critical Orifice					
		Volume Initial/ ( $V_{mi}$ ) cubic feet	Volume Final ( $V_{mf}$ ) cubic feet	Outlet Temp Initial ( $t_{mi}$ ) °F	Outlet Temp Final ( $t_{mf}$ ) °F	Serial Number	Coefficient	Amb Temp Initial ( $t_{amb}$ ) °F	Amb Temp Final ( $t_{amb}$ ) °F	Actual Vacuum in Hg	
11.0	3.3	142.100	153.320	77	78	OX73	0.7780	76	76	14	
10.0	2.0	118.490	126.190	73	74	OX63	0.5905	75	75	15	
10.0	1.2	159.500	165.350	78	78	OX55	0.4455	76	77	17	
12.0	0.7	169.700	175.140	78	79	OX48	0.3451	77	78	18	
18.0	0.3	177.130	182.550	79	78	OX40	0.2303	78	78	20	

Results										
Standardized Data					Dry Gas Meter					
Dry Gas Meter			Critical Office		Calibration Factor		Flowrate		$\Delta H @$	
$\{V_{meas}\}$	$\{Q_{meas}\}$	$\{Q_{crit}\}$	$\{V_{crit}\}$	$\{Q_{crit}\}$	Value	Variation ( $\Delta Y$ )	Std & Corr ( $Q_{avg(corr)}$ )	0.75 SCFM ( $\Delta H @$ ) in H <sub>2</sub> O	Variation ( $\Delta \Delta H @$ )	
cubic feet	cfm	cubic feet	cfm	cfm	(Y)		cfm			
10.864	0.988	10.812	0.983	0.983	0.995	-0.004	0.983	1.877	-0.091	
7.487	0.749	7.467	0.747	0.747	0.997	-0.002	0.747	1.973	0.005	
5.630	0.563	5.626	0.563	0.563	0.999	0.000	0.563	2.060	0.092	
5.223	0.435	5.225	0.435	0.435	1.000	0.001	0.435	1.942	-0.026	
5.199	0.289	5.228	0.290	0.290	1.005	0.006	0.290	1.986	0.019	
					1.000	Y Average			1.968	
										AH/ft Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .

certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Date 12.11.12

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Pre -Test



Meter Box: 6011012

Calibrator: B. Crane

Date: 12/11/2012

Barometric: 29.25

Ambient Temp: 74

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			98	-0.36	98	-0.36
200			201	0.15	200	0.00
300			301	0.13	301	0.13
400			397	-0.35	397	-0.35
500			499	-0.10	498	-0.21

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	99	-0.18	98	-0.36	98	-0.36
200	202	0.30	200	0.00	200	0.00
300	302	0.26	301	0.13	301	0.13
400	399	-0.12	397	-0.35	397	-0.35
500	500	0.00	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	397	-0.35
600	600	0.00
800	802	0.16
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1400	0.00
1600	1602	0.10
1800	1800	0.00

Revised 10/03

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647 aR/in Hg

Calibration Conditions		
Date	Time	
Barometric Pressure		29.4 in Hg
Theoretical Critical Vacuum <sup>1</sup>		13.9 in Hg
Calibration Technician		B. Crane

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient,  $K'$  must be entered in English units,  $(ft^3 \cdot P^{1/2}) / (in. Hg \cdot min)$ .

Run Time	Calibration Data									
Elapsed ( $\odot$ ) min	DGM Office		Metering Console			Critical Office				
	$\Delta H$ ( $P_m$ ) in $H_2O$	Volume Initial ( $V_m$ ) cubic feet	Volume Final ( $V_m$ ) cubic feet	Outlet Temp Initial ( $t_m$ ) $^{\circ}F$	Outlet Temp Final ( $t_m$ ) $^{\circ}F$	Serial Number	Coefficient	Amb Temp Initial ( $t_{amb}$ ) $^{\circ}F$	Amb Temp Final ( $t_{amb}$ ) $^{\circ}F$	Actual Vacuum in Hg
10.0	2.0	987.200	994.830	69	72	OX63	0.5894	73	73	19
12.0	2.0	994.830	1004.040	72	73	OX63	0.5894	73	73	19
10.0	2.0	1004.040	1011.740	73	73	OX63	0.5894	73	74	19

Standardized Data					Results				
Dry Gas Meter			Critical Orifice		Dry Gas Meter				
(V <sub>meter</sub> )	(Q <sub>meter</sub> )	(V <sub>orifice</sub> )	(Q <sub>orifice</sub> )	Value	Calibration Factor	Flowrate	ΔH @		
cubic feet	cfm	cubic feet	cfm	(Y)	(ΔY)	Std & Corr (Q <sub>meter/corr</sub> ) cfm	0.75 SCFM (ΔH@) in H <sub>2</sub> O	Variation (ΔΔH@)	
7.507	0.751	7.513	0.751	1.001	0.002	0.751	1.972	0.005	
9.027	0.752	9.016	0.751	0.999	0.000	0.751	1.965	-0.002	
7.540	0.754	7.510	0.751	0.996	-0.003	0.751	1.965	-0.002	
Protest Gamma	1.000	% Deviation	0.1	0.999	Y Average		1.967	ΔH@ Average	

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .

certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Date 12.16.13

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Post-Test



Meter Box: 6011012

Calibrator: B. Crane

Date: 12/16/2013

Barometric: 29.43

Ambient Temp: 74

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			97	-0.54	99	-0.18
200			200	0.00	201	0.15
300			299	-0.13	301	0.13
400			396	-0.47	398	-0.23
500			497	-0.31	498	-0.21

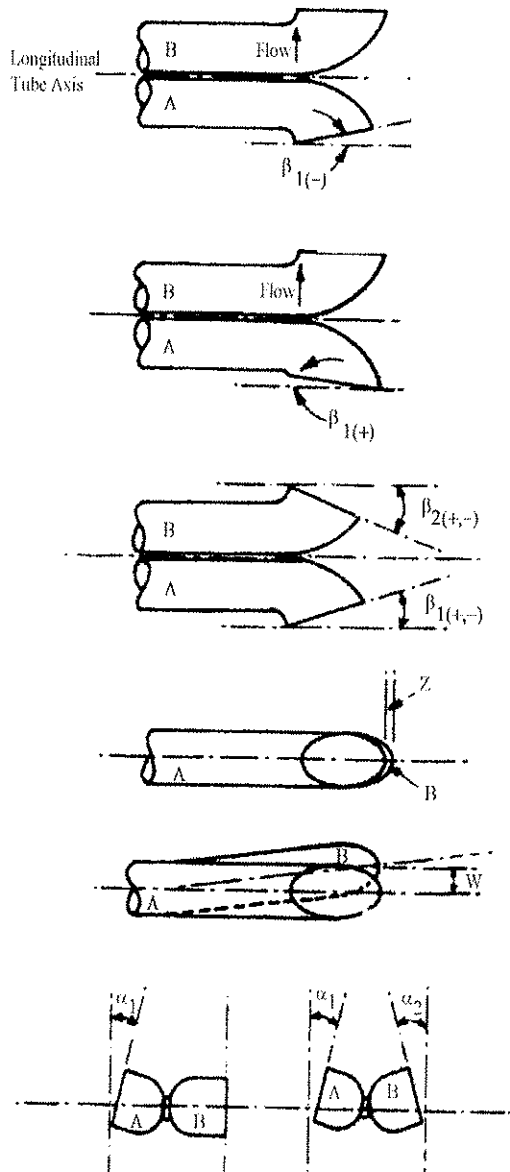
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	97	-0.54	97	-0.54
200	201	0.15	201	0.15	200	0.00
300	300	0.00	300	0.00	299	-0.13
400	397	-0.35	397	-0.35	396	-0.47
500	498	-0.21	497	-0.31	497	-0.31

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	396	-0.47
600	600	0.00
800	801	0.08
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1398	-0.11
1600	1600	0.00
1800	1798	-0.09

## Pitot Tube Inspection Data

Client Name: \_\_\_\_\_

Date: Pre-Sample  
8/15/2013Date: Post-Sample  
12/21/2013

Y	level?	Y
N	obstructions?	N
N	damaged?	N
0	$-10^\circ < \alpha_1 < +10^\circ$	0
1	$-10^\circ < \alpha_2 < +10^\circ$	0
0	$-5^\circ < \beta_1 < +5^\circ$	0
1	$-5^\circ < \beta_2 < +5^\circ$	2
1	$\gamma$	2
0	$\theta$	0
0.680	A	0.68
0.340	$0.2625 < P_A < 0.375$	0.340
0.340	$0.2625 < P_B < 0.375$	0.340
0.250	$0.1875 \leq D_t \leq 0.375$	0.250
0.012	$A \tan \gamma < 0.125''$	0.024
0.00000	$A \tan \theta < 0.03125''$	0.00000
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

**Comments:** 10' effective length M5 probe with s-type pitot tube, 1.4" tips, K-type thermocouple enclosed in a 1.5" OD sheath.

Pitot tube/probe number 354 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

  
12.21.13

**ARI Environmental Inc.**  
**Thermocouple Calibration Data Form**



**Calibrator:** B. Crane  
**Thermocouple ID.** 354  
**Date:**                      **pretest**                      **posttest**  
                                     8/15/2013                      12/21/2013  
**Barometric:**              29.41                      29.1  
**Reference Thermometer = Mercury in glass**

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
<b>Pre- Test</b>	T.C	Ice Water	32.1	32.0	0.02
		Ambient	74.2	74.5	-0.06
		Heat Source	296.8	297.1	-0.04
<b>Post- Test</b>	T.C	Ice Water	31.9	32.1	-0.04
		Ambient	64.7	65.1	-0.08
		Heat Source	290.8	292.4	-0.21

$a \text{ (temp. diff.)} = (\text{ref. temp.} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$

Where  $-1.5 < a < 1.5$



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## **APPENDIX E**

## **Process Data**

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# MAIN BODY OF REPORT Process Data Summary Tables

NSPS-Ja		Run	5F-1	5F-2	5F-3	Test Average
FCCU Regenerator Coke Burn, lb/hr			34194	34131	33943	34089
ESP Total Primary Power, KW			66	66	66	66
ESP Total Secondary Current, Amps			2296	2298	2299	2298
SO <sub>2</sub> , ppm @ 0%O <sub>2</sub>			2.8	2.0	2.7	2.5
NO <sub>x</sub> , ppm @ 0%O <sub>2</sub>			0.2	0.0	0.0	0.1



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Date: 12/10/13

## **APPENDIX F**

## **Test Program Qualifications**

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## Test Program Qualifications

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ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

### **Steven Flaherty**

Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

### **Jeff Goldfine**

Mr. Goldfine is a Project Manager with ARI. His 11 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Goldfine is presently certified as a QSTI by the SES pursuant to the requirements of ASTM D7036-04.

### **W. Alex Hildreth**

Mr. Hildreth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Hildreth has 2 years of experience in conducting various source emission test programs. Mr. Hildreth is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

### **Jayce Best**

Mr. Best is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

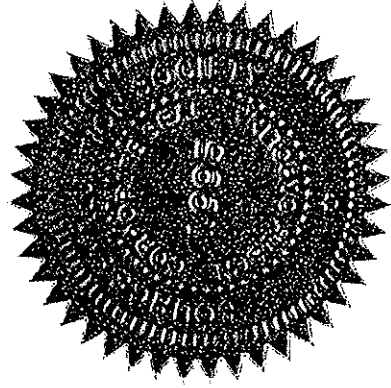
C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.

2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

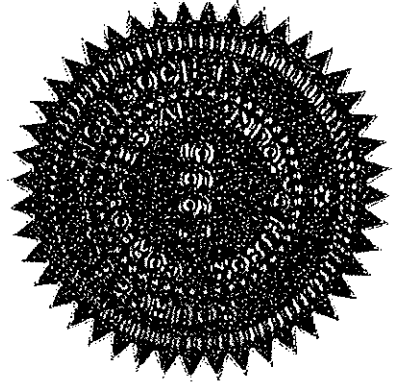
Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Baerhoff, QSTI/QSTO Review Board

Karen D. Kajlya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board



APPLICATION

NO.

2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Leroy Owens, QSTI/QSTO Review Board

C. David Bagweff, QSTI/QSTO Review Board

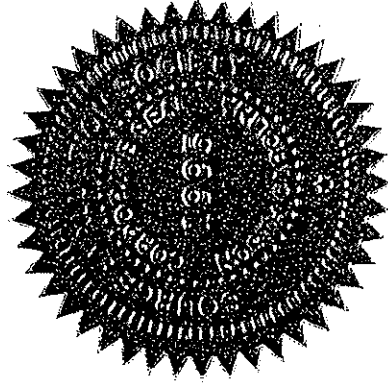
Karen D. Kallja-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION

NO.

2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

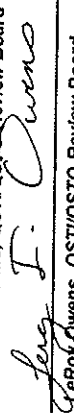
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **HAZARDOUS METALS MEASUREMENT SAMPLING METHODS**

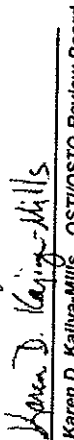
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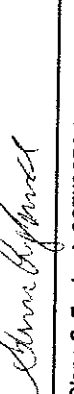
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

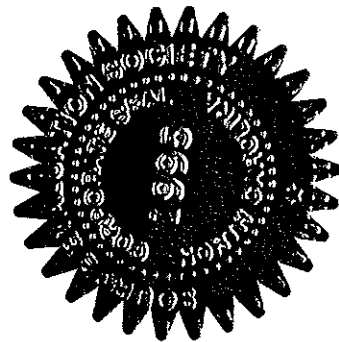
  
LeRoy Owens, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Karen D. Kajiya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual


LET IT BE KNOWN THAT


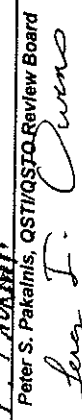
**JEFF S. GOLDFINE**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR


### **MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS**

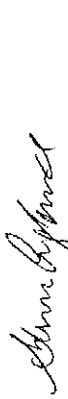
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Peter R. Westlin, QSTI/QSTO Review Board

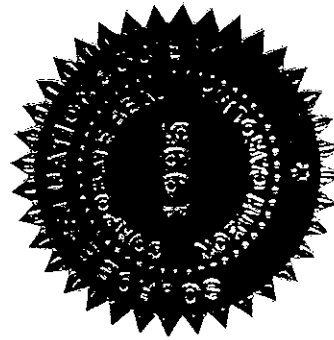
  
Peter S. Pakalnis, QSTI/QSTO Review Board  
  
LeRoy F. Owens, QSTI/QSTO Review Board

  
C. David Bagweff, QSTI/QSTO Review Board

  
Karen D. Kallja-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2010-489



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

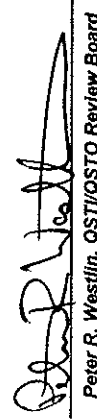
LET IT BE KNOWN THAT

**JEFF S. GOLDFINE**

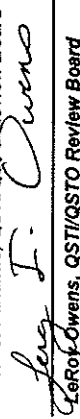
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**

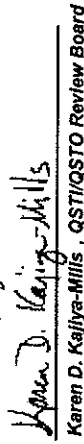
ISSUED THIS 16<sup>TH</sup> DAY OF NOVEMBER 2010 AND EFFECTIVE UNTIL NOVEMBER 15<sup>TH</sup>, 2015

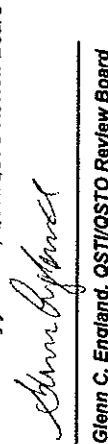
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

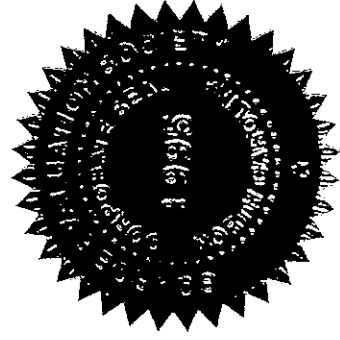
  
Leroy Owens, QSTI/QSTO Review Board

  
C. David Bagweff, QSTI/QSTO Review Board

  
Karen D. Kajiya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2010-489



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

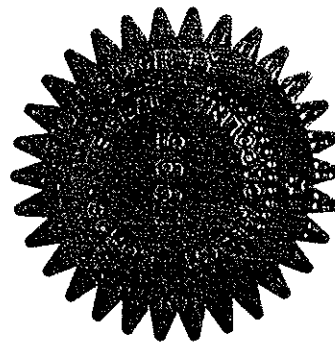
LET IT BE KNOWN THAT


**JEFF S. GOLDFINE**


HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

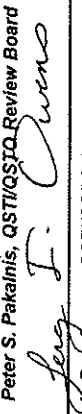
### HAZARDOUS METALS MEASUREMENT SAMPLING METHODS


ISSUED THIS 29<sup>TH</sup> DAY OF NOVEMBER 2011 AND EFFECTIVE UNTIL NOVEMBER 28<sup>TH</sup>, 2016

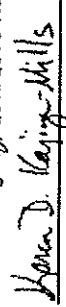



  
Peter R. Westlin, QSTI/QSTO Review Board

  
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C. David Bagweff, QSTI/QSTO Review Board

  
Karen D. Kajiya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2010-489

# TEST REPORT

## COMPLIANCE EMISSION TEST CONSENT DECREE FLUIDIZED CATALYTIC CRACKING UNIT 600

BP PRODUCTS NORTH AMERICA, INC.  
WHITING, INDIANA

PREPARED FOR:

***BP PRODUCTS NORTH AMERICA, INC.***

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ARI Project No. 566-103  
ARI Proposal No. 12313  
BP Purchase Order No. 3000262112  
Test Dates: December 11 and 12, 2013



## TABLE OF CONTENTS

<b>SECTIONS</b>	<b>PAGE</b>
REPORT CERTIFICATION	ii
Section 1 INTRODUCTION AND SUMMARY	1-1
Section 2 TESTING AND ANALYTICAL PROCEDURES	2-1
2.1 Overview	2-1
2.2 Methodology	2-1
2.2.1 Sampling Locations (USEPA Method 1)	2-1
2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)	2-1
2.2.3 Molecular Weight (USEPA Method 3)	2-1
2.2.4 Flue Gas Moisture Content (USEPA Method 4)	2-1
2.2.5 Total PM, PM <sub>10</sub> and CPM (USEPA Methods 201A and 202)	2-2
2.2.5.1 Sampling Apparatus	2-2
2.2.5.2 Sampling Procedures	2-4
2.2.5.3 Sample Recovery Procedures	2-4
2.2.5.4 Analytical Procedures	2-6
Section 3 PROCESS DESCRIPTION	3-1
Section 4 TEST RESULTS	4-1
<b>FIGURES</b>	
Figure 2-1 USEPA Methods 201A/202 Particulate Matter Sampling Train	2-3
<b>TABLES</b>	
Table 1-1 Summary of FCCU 600 Stack PM <sub>10</sub> and CPM Test Results	1-2
Table 3-1 FCCU 600 Stack Process Data Summary	3-1
Table 4-1 FCCU 600 Stack PM <sub>10</sub> and CPM Test Results Summary	4-2
<b>APPENDICES</b>	
Appendix A Calculation Summaries	
Appendix B Field Data	
Appendix C Analytical Data	
Appendix D Calibration Data	
Appendix E Process Data	
Appendix F Test Program Qualifications	



## REPORT CERTIFICATION

---

### STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

A handwritten signature in black ink, appearing to read "Steve Flaherty", is written over a horizontal line.

Steve Flaherty, QSTI  
Senior Project Manager, Source Testing Division  
ARI Environmental, Inc.

A handwritten signature in black ink, appearing to read "Hank Taylor", is written over a horizontal line.

Hank Taylor, QI  
Quality Assurance Manager, Source Testing Division  
ARI Environmental, Inc.



## SECTION ONE

## Introduction and Summary

---

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 600 stack at their refinery located in Whiting, Indiana. Testing was conducted on December 11 and 12, 2013.

Four approximately 120-minute test runs were conducted on the FCCU 600 stack to determine the concentrations and emission rates of total PM, PM under 10 microns (PM<sub>10</sub>) and condensable PM (CPM). The emission test was performed to fulfill the testing requirements of BP's Consent Decree.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Brandon Mik of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Jeff Goldfine, Jayce Best and Alex Hildreth of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.



# SECTION ONE

# Introduction and Summary

**TABLE 1-1. SUMMARY OF FCCU 600 STACK PM<sub>10</sub> AND CPM TEST RESULTS**

TEST RUN NO. :	PM-1	PM-2	PM-3	PM-4	
TEST DATE :	12/11/2013	12/11/2013	12/12/2013	12/12/2013	
TEST TIME :	11:00 - 13:01	14:10 - 16:10	10:55 - 12:55	13:50 - 15:51	Average

## **Filterable PM<sub>10</sub>**

Concentration					
grains/dscf	0.0018	0.0058	0.0086	0.0090	0.0063
mg/dscm	4.216	13.332	19.584	20.487	14.405
Emission rate					
lb/hr	1.984	6.183	9.024	9.222	6.603
lb/1,000 lb coke burn	0.063	0.194	0.265	0.282	0.201

## **Condensable PM<sub>10</sub>**

Concentration					
grains/dscf	0.0257	0.0195	0.0238	0.0230	0.0230
mg/dscm	58.769	44.551	54.440	52.584	52.586
Emission rate					
lb/hr	27.651	20.664	25.084	23.670	24.267
lb/1,000 lb coke burn	0.873	0.649	0.737	0.724	0.746

## **Total PM<sub>10</sub>**

Concentration					
grains/dscf	0.0275	0.0253	0.0323	0.0319	0.0293
mg/dscm	62.985	57.883	74.024	73.071	66.991
Emission rate					
lb/hr	29.634	26.847	34.108	32.893	30.871
lb/1,000 lb coke burn	0.936	0.843	1.002	1.006	0.947

## **Filterable >PM<sub>10</sub>**

Concentration					
grains/dscf	0.0001	0.0001	0.0004	0.0001	0.0001
mg/dscm	0.136	0.180	0.835	0.138	0.322
Emission rate					
lb/hr	0.064	0.084	0.385	0.062	0.149
lb/1,000 lb coke burn	0.002	0.003	0.011	0.002	0.005

## **Total PM (PM<sub>10</sub> + >PM<sub>10</sub>)**

Concentration					
grains/dscf	0.0276	0.0254	0.0327	0.0320	0.0294
mg/dscm	63.121	58.063	74.860	73.209	67.313
Emission rate					
lb/hr	29.698	26.931	34.493	32.955	31.019
lb/1,000 lb coke burn	0.938	0.846	1.014	1.008	0.951



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 600 stack at the BP refinery located in Whiting, Indiana. Testing was conducted on December 11 and 12, 2013.

Four approximately 120-minute test runs were conducted on the FCCU 600 stack to determine the concentrations and emission rates of total PM, PM<sub>10</sub> and CPM.

### 2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

#### 2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted at the FCCU 600 stack in the two (2) sampling ports provided in the 96-inch diameter duct. The sample ports are located approximately 840 inches downstream and 480 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

#### 2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

#### 2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations of each collected bag. The nitrogen (N<sub>2</sub>) content was calculated as the difference.

#### 2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Methods 201A and 202 procedures described in Subsection 2.2.5.



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.2.5 Total PM, PM<sub>10</sub> and CPM (USEPA Methods 201A and 202)

Sampling was conducted in accordance with USEPA Methods 201A and 202 using an Apex Instruments, Inc. PM sampling train (see Figure 2-1). The back half impinger catch was analyzed for CPM in accordance with USEPA Method 202 procedures. The front half was analyzed for filterable PM<sub>10</sub> and >PM<sub>10</sub> to allow for calculation of total filterable PM in accordance with USEPA Method 201A procedures.

PM<sub>10</sub> was determined using the procedures of USEPA Method 201A. Sampling was conducted at a constant rate in order to achieve the 10 microns cut-rate of the cyclone separator. Dwell times at each sample point were calculated based on the stack gas velocity and gas meter temperature. Although USEPA Method 201A has an acceptable isokinetic range of 80 - 120%, this test targeted the more stringent isokinetic range of 90 - 110% to allow for the calculation of total PM following the procedural requirements of the method. Total PM was calculated as the total filterable PM plus CPM.

#### 2.2.5.1 Sampling Apparatus

Assembled by ARI personnel, the sampling train consisted of the following:

Cyclone Separator - Apex Instruments, 316 stainless steel design - 10 micron cut-rate.

Cyclone Nozzle - Stainless steel - integrated with cyclone, sized to attain PM<sub>10</sub> cut-rate.

Probe - Stainless steel with a heating system capable of maintaining a probe exit temperature of 248°F.

Pitot Tube - Type-S, attached to probe for monitoring stack gas velocity.

Heated Filter Holder - Borosilicate glass filter with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 248°F ±25°F during sampling. A thermocouple was placed in the back half of the filter support in direct contact with the sample stream. A quartz fiber filter that met the requirements of USEPA Method 5 was used.

Ambient Filter Holder - Unheated borosilicate glass filter with a 4-in. Teflon frit filter support, Teflon filter and a silicone rubber gasket. A thermocouple was placed in the back half of the filter holder to measure sample gas temperature by direct contact with the sample stream. Temperature was maintained between 65 and 85°F. A Teflon filter disc was placed in the filter holder.

Draft Gauge - Inclined manometer with a readability of 0.01-in. H<sub>2</sub>O in the 0 to 1-in. range and 0.1-in. H<sub>2</sub>O in the 1 to 10-in. range.

Condenser - Glass, coil type with compatible fittings.

## SECTION TWO

## Testing and Analytical Procedures

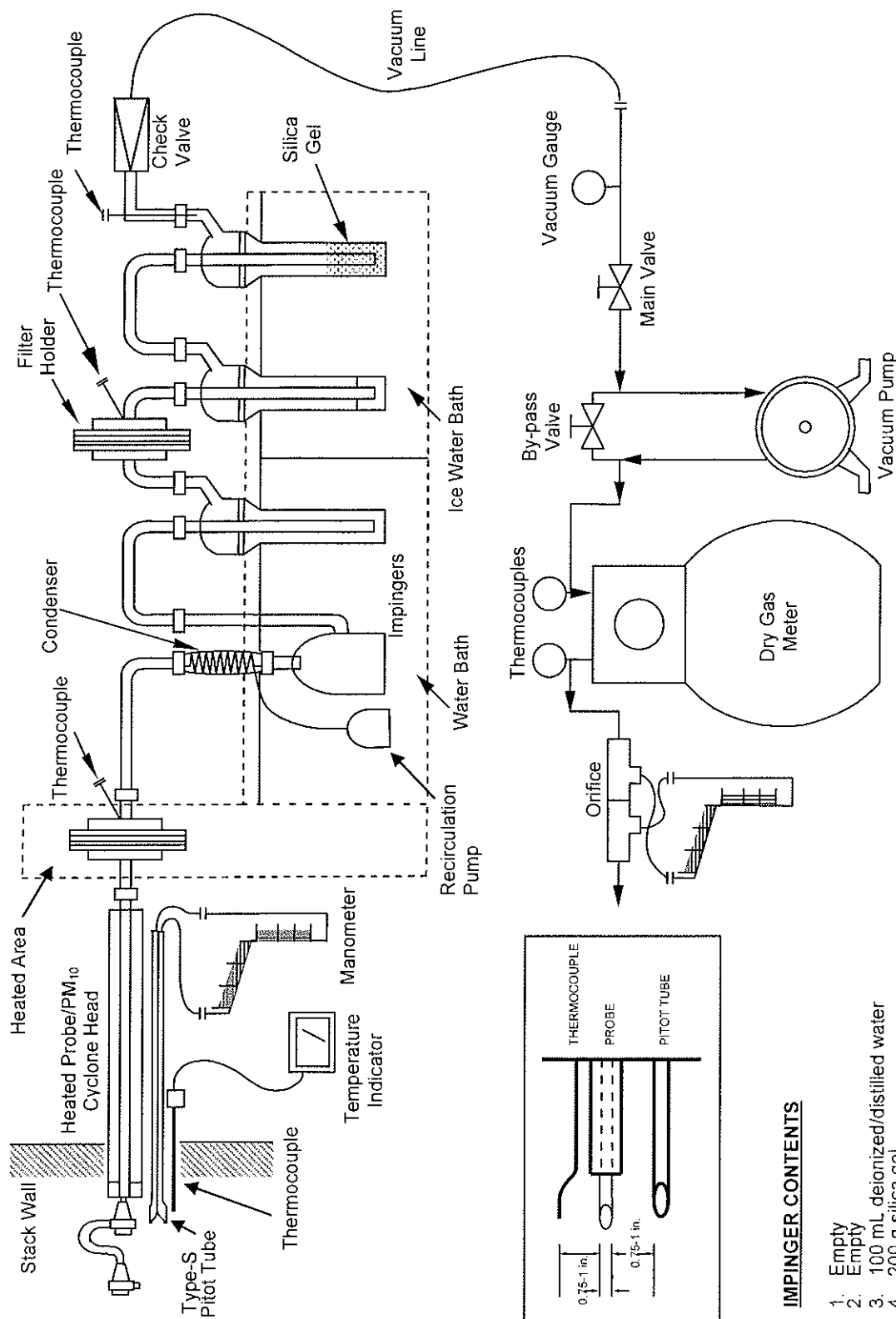


FIGURE 2-1. USEPA METHODS 201A/202 PARTICULATE MATTER SAMPLING TRAIN



## SECTION TWO

## Testing and Analytical Procedures

---

Impingers - Four (4) impingers connected in series with glass ball joints. The first impinger was a Method 23 type condenser with a condensate drop-out. The second, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second and third impingers were connected using the ambient filter holder.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

### 2.2.5.2 Sampling Procedures

After the minimum number of traverse points was selected, the stack pressure, temperature, moisture and range of velocity head were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers were initially empty. The third impinger contained 100 mL of deionized/distilled (DI) water. The fourth impinger contained 200 grams of silica gel.

The impingers were placed in a container that had two compartments. The first two impingers were placed in the first compartment, and the third and fourth impingers were placed in the second compartment. The first compartment contained water that was circulated through the condenser to reduce the sample gas to between 65 and 85°F at the exit of the ambient filter. The second compartment contained ice water to reduce the sample gas to ≤68°F upon exiting the last impinger. Both temperatures were recorded at each traverse point interval throughout each test run.

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft<sup>3</sup>/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was again leak-checked by the same procedure, but at the highest vacuum attained during the test run. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

### 2.2.5.3 Sample Recovery Procedures

After sampling was completed, a post-test nitrogen purge was conducted with the impingers still on ice at a rate ≥14 liters per minute for 60 minutes. Before the purge step began, the short



## SECTION TWO

## Testing and Analytical Procedures

---

stem of the first impinger was replaced with a long stem that was within ½-inch of the bottom of the impinger. If the stem did not extend below the water level in the impinger by at least 1 cm, a measured amount of degassed DI water was added to adjust the level.

### Method 201A

The sample fractions were recovered as follows:

Container 1 - The filter was removed from the holder and placed in a petri dish.

Container 2 - The  $>PM_{10}$  was acetone rinsed from the cyclone cup, the internal surface of the nozzle and the outside surface of the downcomer line. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 3 - The  $\leq PM_{10}$  filterable PM was acetone rinsed from the cyclone exit tube and internal surfaces of the  $PM_{10}$  cyclone assembly, probe liner and sample exposed surfaces prior to the filter. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 4 - 150 mL of acetone was taken for blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

### Method 202 (Including Field Recovery Blank Train)

The sample fractions were recovered as follows:

Container 1 - The contents from the first two impingers were placed into a glass container. The impingers (including the short stem), connecting glassware and front-half of the ambient filter holder were quantitatively rinsed twice with DI water, and the rinse was added to this container. The liquid level was marked after the container was sealed.

Container 2 - The first two impingers (including the short stem), connecting glassware and front half of the ambient filter holder were rinsed with acetone, followed by two rinses with hexane, and placed in a glass container. The liquid level was marked after the container was sealed.

Container 3 - The ambient filter was removed and placed in a petri dish.

Containers 4, 5 & 6 - 150 mL of acetone, DI water and hexane were taken for blank analysis. The blanks were obtained and treated in a similar manner as the contents of Containers 1 and 2.

The contents of the third impinger were weighed and discarded. The contents of the fourth impinger (silica gel) were weighed to the nearest gram.



## SECTION TWO

## Testing and Analytical Procedures

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### 2.2.5.4 Analytical Procedures

#### Method 201A

The analytical procedures followed those described in USEPA Method 201A.

Container 1 - The filter and any loose PM were transferred from the sample container to a tared glass weighing dish and placed in a desiccator for 24 hours. The filter was dried and weighed to a constant weight. The results were reported to the nearest 0.1 mg.

Containers 2 & 3 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The contents were then placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 4 - The acetone blank was transferred to a tared beaker, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

#### Method 202 (Including Field Recovery Blank Train)

The analytical procedures followed those described in USEPA Method 202.

Container 1 - The liquid in this container was measured volumetrically and placed into a separatory funnel. Approximately 30 mL of hexane was added, mixed well and the lower organic phase drained off. This procedure was repeated twice, leaving a small amount of the organic/hexane phase in the separatory funnel each time to yield approximately 90 mL of organic extract. This organic extract was combined with Container 2. The aqueous fraction from Container 1 was transferred to a tared beaker, evaporated in an oven at 105°C to no less than 10 mL and allowed to air dry at ambient temperature. If a dried constant weight could not be achieved, the residue was redissolved in 100 mL of water and titrated with 0.1N ammonium hydroxide to a pH of 7.0. The aqueous phase was then evaporated in an oven at 105°C to approximately 10 mL, transferred to a pre-weighed tin, evaporated to dryness in a fume hood at ambient temperature and pressure, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the inorganic PM collected in the sampling train back half.

Container 2 - The contents of this container were combined with the organic extract from Container 1, placed in a tared beaker and evaporated at ambient temperature and pressure in a fume hood to no less than 10 mL. The beaker contents were then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the organic PM collected in the sampling train back half.



## SECTION TWO

## Testing and Analytical Procedures

---

Container 3 - The ambient filter was folded in quarters and placed into a 50 mL extraction tube. Sufficient DI water was used to cover the filter. The extraction tube was placed in a sonication bath, and the water soluble material was extracted for a minimum of 2 minutes. The aqueous extract was combined with the contents of Container 1. This step was completed a total of three times. After completion of the aqueous extraction, the filter was covered with a sufficient amount of hexane. The extraction tube was then placed in a sonication bath, and the organic material was extracted for a minimum of 2 minutes. The organic extract was combined with the contents of Container 2. This step was completed a total of three times. The procedures for Container 3 were completed prior to any procedures for Containers 1 and 2.

Container 4 - The acetone blank was transferred to a tared beaker, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 5 - The water blank was transferred to a tared beaker and evaporated to approximately 10 mL in an oven at 105°C. It was then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 6 - The hexane blank was transferred to a tared beaker and evaporated to approximately 10 mL at ambient temperature and pressure in a fume hood. It was then transferred to a pre-weighed tin, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

**SECTION THREE****Process Description**

The FCCU 600, constructed in 1946, is identified as Unit ID 240 and rated at 80,000 barrels per day. This facility converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

**TABLE 3-1. FCCU 600 STACK PROCESS DATA SUMMARY**

TEST RUN NO. :	PM-1	PM-2	PM-3	PM-4	Average
Total Feed Rate, MBPD	56.8	56.9	57.0	57.0	56.9
FCCU Regenerator Coke Burn, lb/hr	31,663	31,851	34,031	32,685	32,558
Ammonia Flow to ESP, lb/hr	80.0	80.1	80.0	80.3	80.1
ESP Total Primary Power, KW	140	140	139	139	140
ESP Total Secondary Current, mA	4,517	4,507	4,511	4,515	4,512
SO <sub>2</sub> , ppm @ 0% O <sub>2</sub>	10.3	7.8	1.7	1.3	6.6
NO <sub>x</sub> , ppm @ 0% O <sub>2</sub>	0.0	0.0	0.0	0.0	0.0
SO <sub>2</sub> Additive Rate, PPD	337	700	700	700	579
Ammonia Slip (Calc), ppm	0.0	0.0	0.0	0.0	0.0
Regenerator Plenum Outlet Temperature, °F	1,365	1,365	1,351	1,347	1,360
Average ESP Inlet Temperature, °F	686	686	685	686	686



## **SECTION FOUR**

## **Test Results**

---

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.



# SECTION FOUR

# Test Results

**TABLE 4-1. FCCU 600 STACK PM<sub>10</sub> AND CPM TEST RESULTS SUMMARY**

TEST RUN NO.	:	PM-1	PM-2	PM-3	PM-4	
TEST DATE	:	12/11/2013	12/11/2013	12/12/2013	12/12/2013	
TEST TIME	:	11:00 - 13:01	14:10 - 16:10	10:55 - 12:55	13:50 - 15:51	Average

## Process Data

Coke burn rate, lb/hr	31,663	31,851	34,031	32,685	32,558
-----------------------	--------	--------	--------	--------	--------

## Stack Gas Parameters

Temperature, °F	646.4	644.3	642.1	644.3	644.3
Velocity, av. ft/sec	120.0	120.3	114.3	114.6	117.3
Volumetric flow, acfm	361,800	362,896	344,649	345,603	353,737
Volumetric flow, scfm	170,301	171,152	163,086	163,257	166,949
Volumetric flow, scfh	10,218,040	10,269,098	9,785,157	9,795,448	10,016,936
Volumetric flow, dscfm	125,590	123,808	122,993	120,159	123,137
Volumetric flow, dscfh	7,535,428	7,428,452	7,379,561	7,209,535	7,388,244
Mass flow, Mlb/hr db	604.8	595.2	591.7	578.3	592.5
Moisture, av. % vol.	26.3	27.7	24.6	26.4	26.2
Molecular weight, lb/lb-mole db	30.9	30.9	30.9	30.9	30.9
CO <sub>2</sub> , av. % vol.	17.7	17.3	17.4	17.5	17.5
O <sub>2</sub> , av. % vol.	2.2	2.5	2.6	2.6	2.5

## Particulate Sample

Time, min.	118.66	118.52	118.86	119.09	118.78
Volume, dscf	38.952	39.204	38.048	38.267	38.618
>PM <sub>10</sub> , mg	0.15	0.20	0.90	0.15	0.35
Filterable PM <sub>10</sub> , mg	4.7	14.8	21.1	22.2	15.7
Condensable PM <sub>10</sub> , mg	64.82	49.46	58.65	56.98	57.48
Total PM <sub>10</sub> , mg	69.5	64.3	79.8	79.2	73.2
Isokinetic ratio, %	107.1	109.5	106.7	109.6	108.2
D <sub>50</sub> cutpoint, µm	9.48	9.30	9.83	9.62	9.56

## Filterable PM<sub>10</sub>

Concentration					
grains/dscf	0.0018	0.0058	0.0086	0.0090	0.0063
x 10 <sup>-6</sup> lb/dscf	0.263	0.832	1.223	1.279	0.899
mg/dscm	4.216	13.332	19.584	20.487	14.405
Emission rate					
lb/hr	1.984	6.183	9.024	9.222	6.603
lb/1,000 lb coke burn	0.063	0.194	0.265	0.282	0.201

## Condensable PM<sub>10</sub>

Concentration					
grains/dscf	0.0257	0.0195	0.0238	0.0230	0.0230
x 10 <sup>-6</sup> lb/dscf	3.669	2.782	3.399	3.283	3.283
mg/dscm	58.769	44.551	54.440	52.584	52.586
Emission rate					
lb/hr	27.651	20.664	25.084	23.670	24.267
lb/1,000 lb coke burn	0.873	0.649	0.737	0.724	0.746



# SECTION FOUR

# Test Results

**TABLE 4-1 (CONTINUED). FCCU 600 STACK PM<sub>10</sub> AND CPM TEST RESULTS SUMMARY**

TEST RUN NO.	PM-1	PM-2	PM-3	PM-4	
TEST DATE	12/11/2013	12/11/2013	12/12/2013	12/12/2013	
TEST TIME	11:00 - 13:01	14:10 - 16:10	10:55 - 12:55	13:50 - 15:51	<u>Average</u>
<b><u>Total PM<sub>10</sub></u></b>					
Concentration					
grains/dscf	0.0275	0.0253	0.0323	0.0319	0.0293
x 10 <sup>-6</sup> lb/dscf	3.933	3.614	4.622	4.562	4.183
mg/dscm	62.985	57.883	74.024	73.071	66.991
Emission rate					
lb/hr	29.634	26.847	34.108	32.893	30.871
lb/1,000 lb coke burn	0.936	0.843	1.002	1.006	0.947
<b><u>Filterable &gt;PM<sub>10</sub></u></b>					
Concentration					
grains/dscf	0.0001	0.0001	0.0004	0.0001	0.0001
x 10 <sup>-6</sup> lb/dscf	0.008	0.011	0.052	0.009	0.020
mg/dscm	0.136	0.180	0.835	0.138	0.322
Emission rate					
lb/hr	0.064	0.084	0.385	0.062	0.149
lb/1,000 lb coke burn	0.002	0.003	0.011	0.002	0.005
<b><u>Total PM (PM<sub>10</sub> + &gt;PM<sub>10</sub>)</u></b>					
Concentration					
grains/dscf	0.0276	0.0254	0.0327	0.0320	0.0294
x 10 <sup>-6</sup> lb/dscf	3.941	3.625	4.674	4.571	4.203
mg/dscm	63.121	58.063	74.860	73.209	67.313
Emission rate					
lb/hr	29.698	26.931	34.493	32.955	31.019
lb/1,000 lb coke burn	0.938	0.846	1.014	1.008	0.951



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX A**

## **Calculation Summaries**

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## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-1

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.7 %
Oxygen (O <sub>2</sub> ):	2.2 %
Nitrogen (N <sub>2</sub> ):	80.1 %
Fractional Moisture Content (B <sub>wo</sub> )	0.2625
Stack Temperature (T <sub>s</sub> ):	646.4 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.4315 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.60 inches Hg
Static Pressure (S <sub>t</sub> )	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.920 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.528 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.512 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 119.963 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 361,800 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 170,301 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 10,218,040 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 125,590 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,535,428 \text{ dscfh}$$



## USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-1

### Data Input:

Volume metered ( $V_m$ ):	36.975 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.60 inches Hg
Meter sample rate ( $\Delta H$ ):	0.37 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	36.3 °F
Volume of moisture collected ( $V_{lc}$ ):	294.6 milliliters
Stack Temperature ( $T_s$ ):	646.4 °F
Static Pressure ( $St$ ):	-1.2 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ Hg}} \right) \times \left( \frac{P_{bar} + \Delta H}{T_m + 460} \right) = 38.952 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 13.867 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2625 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 26.25 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_s(^{\circ}K) = ((T_s - 32) \times 0.5556) + 273 = 614.4 \text{ }^{\circ}\text{Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 751.87 \text{ mm Hg}$$

$$B_{vos} = \frac{\sqrt[10]{10^{\left( A \left( \frac{B}{(T_{s(K)} - C) \right) \right)}}}{P_{s(\text{mmHg})}}$$

where:

A= 8.361

B=1893.5

C=27.65

$$= 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{saturated} = B_{vos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$\% \text{moisture} = B_{wo} \times 100 = 26.25 \%$$



**USEPA Method 201A PM<sub>2.5</sub> Emissions  
D<sub>50</sub> Cutpoint Calculation Summary**

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-1

**Data Input**

Stack temperature (T <sub>s</sub> ):	646.4 °F
Fractional Moisture content (B <sub>ws</sub> ):	0.2625 %
Oxygen (O <sub>2</sub> ):	2.200 %
Stack pressure (P <sub>s</sub> ):	29.51 Inches Hg Abs.
Volume metered (V <sub>mstd</sub> ):	38.952 dscf
Volume of water vapor (V <sub>wstd</sub> ):	13.867 scf
Molecular weight of gas, wet basis (M <sub>s</sub> ):	27.528 lb/lb-mole
Test length (θ):	118.66 minutes
D <sub>p</sub> :	10.0 microns

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Stack gas viscosity:**

$$\mu = 150.3162 \times \left( 13.4622 \times \sqrt{\frac{T_s + 460}{P_s}} \right) + \left( 3.86153 \times 10^{-5} \times (T_s + 460)^{1.5} \right) + \left( 0.591123 \times (\%O_{2,wd}) \right) - (91.9723 \times B_{ws}) + \left( 1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^2 \right) = 282.32 \text{ micropoise}$$

**Sample flow rate @ standard conditions:**

$$Q_{s,29.92} = \frac{V_{mstd}}{\theta} = 0.328 \text{ dscfm}$$

**Sample flow rate through PM<sub>10</sub> cyclone:**

$$Q_c = \frac{29.92}{528} \times Q_{s,51} \times \left( \frac{1}{(1-B_{ws})} \right) \times \left( \frac{[T_s + 460]}{P_s} \right) = 0.946 \text{ cfm}$$

**Calculated Reynolds Number**

$$N_{re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_s}{(T_s + 460)} \right) \times \left( \frac{Q_c}{\mu} \right) = 2125$$

**Cunningham Correction Factor**

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{[T_s + 460]}{M_s} \right)^{0.50} \right) = 1.0347$$

**D<sub>50</sub> cutpoint (for Cyclone I):**

$$D_{50} = \left( 0.15625 \times \left( \frac{[T_s + 460]}{(M_s \times P_s)} \right)^{0.2001} \right) \times \left( \frac{\mu}{Q_c} \right)^{0.7091} = 9.482 \text{ }\mu\text{m}$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 600  
TEST DATE: 12/11/13  
RUN NUMBER: PM-1

**Data Input:**

$V_m$ :	36.975	ft <sup>3</sup>	$Q_s$ :	125,590	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	646.4	°F
$P_{bar}$ :	29.60	in.Hg	Runtime:	118.66	minutes
$\Delta H$ :	0.37	in.H <sub>2</sub> O	$V_s$ :	119.963	ft/sec
$T_m$ :	36.3	°F	$P_s$ :	29.51	in.Hg
$V_{lc}$ :	294.6	mL	Noz. diam:	0.150	inches
$N$ :	0.0992		$m_{lb}$ :	0.00	mg
$V_t$ :	4.19	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	71.65	mg			
$m_o$ :	0.25	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{msld} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 38.952 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 7.08 \text{ mg}$$

Mass of the field blank:

$$m_{lb} = m_{lb} + m_{ob} = 0.00 \text{ mg}$$

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 64.57 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{lb} = 64.82 \text{ mg}$$



# USEPA Method 201A PM<sub>10</sub> Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-1

## Data Input

Barometric pressure (P <sub>bar</sub> ):	29.60 inches Hg	Particulate Weight:	
Stack pressure (P <sub>s</sub> ):	29.51 inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filter)	2.05 milligrams
Test length (t):	118.66 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	0.15 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1500 inches		
Sample nozzle area (A <sub>n</sub> ):	0.000123 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>1</sub> , (Container 4) (Rinse)	2.60 milligrams
Stack temperature (T <sub>s</sub> ):	646.4 °F	Total PM <sub>10</sub> front half:	4.65 milligrams
Volume metered (V <sub>mstd</sub> ):	38.952 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	119.963 feet/second	Total PM front half	4.80 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	7,535,428 dscf/hour	Total corrected PM <sub>10</sub> back half:	64.82 milligrams
Fractional Moisture content (B <sub>wo</sub> ):	0.2625		
Coke Burn Rate (R <sub>c</sub> ):	31,663 lb/hr	Total PM <sub>10</sub> weight (M <sub>10</sub> ):	69.47 milligrams
		Total PM weight (M <sub>p</sub> ):	69.62 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wo})} = 107.1 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate:

$$E_p = C_s^1 \times Q_{std}$$

$$\text{pmr}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)}$$

0.0276 total PM gr/dscf  
0.0001 >PM<sub>10</sub> gr/dscf  
0.0018 filterable PM<sub>10</sub> gr/dscf  
0.0257 condensible PM<sub>10</sub> gr/dscf  
0.0275 PM<sub>10</sub> gr/dscf  
  
63.121 total PM mg/dscm  
0.136 >PM<sub>10</sub> mg/dscm  
4.216 filterable PM<sub>10</sub> mg/dscm  
58.769 condensible PM<sub>10</sub> mg/dscm  
62.985 PM<sub>10</sub> mg/dscm  
  
3.941 x 10<sup>-6</sup> total PM lb/dscf  
0.008 x 10<sup>-6</sup> >PM<sub>10</sub> lb/dscf  
0.263 x 10<sup>-6</sup> filterable PM<sub>10</sub> lb/dscf  
3.669 x 10<sup>-6</sup> condensible PM<sub>10</sub> lb/dscf  
3.933 x 10<sup>-6</sup> PM<sub>10</sub> lb/dscf

29.698 total PM lb/hr  
0.064 >PM<sub>10</sub> lb/hr  
1.984 filterable PM<sub>10</sub> lb/hr  
27.651 condensible PM<sub>10</sub> lb/hr  
29.634 PM<sub>10</sub> lb/hr  
  
0.938 total PM lb/1000lb coke burn  
0.002 >PM<sub>10</sub> lb/1000lb coke burn  
0.063 filterable PM<sub>10</sub> lb/1000lb coke burn  
0.873 condensible PM<sub>10</sub> lb/1000 coke burn  
0.936 PM<sub>10</sub> lb/1000 coke burn



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-2

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.3 %
Oxygen (O <sub>2</sub> ):	2.5 %
Nitrogen (N <sub>2</sub> ):	80.2 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2766
Stack Temperature (T <sub>s</sub> ):	644.3 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.4315 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.60 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.868 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.308 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.512 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 120.327 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 362,896 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 171,152 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 10,269,098 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 123,808 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,428,452 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-2

## Data Input:

Volume metered ( $V_m$ ):	37.005 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.60 inches Hg
Meter sample rate ( $\Delta H$ ):	0.37 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	33.5 °F
Volume of moisture collected ( $V_{lc}$ ):	318.5 milliliters
Stack Temperature ( $T_s$ ):	644.3 °F
Static Pressure ( $S_t$ ):	-1.2 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 39.204 \text{ dscf}$$

### Volume of water vapor in sample:

$$V_{W_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 14.992 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{W_{std}}}{(V_{m_{std}} + V_{W_{std}})} = 0.2766 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 27.66 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 613.2 \text{ °Kelvin}$$

$$P_{e(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 751.87 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}}$$

where:

A= 8.361

B=1893.5

C=27.65

$$= 1.0000$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$\% \text{moisture} = B_{wo} \times 100 = 27.66 \%$$



# USEPA Method 201A PM<sub>2.5</sub> Emissions D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-2

## Data Input

Stack temperature (T<sub>s</sub>): 644.3 °F  
Fractional Moisture content (B<sub>wa</sub>): 0.2766 %  
Oxygen (O<sub>2</sub>): 2.500 %  
Stack pressure (P<sub>s</sub>): 29.51 inches Hg Abs.  
Volume metered (V<sub>mstd</sub>): 39.204 dscf  
Volume of water vapor (V<sub>wstd</sub>): 14.992 scf  
Molecular weight of gas, wet basis (M<sub>s</sub>): 27.308 lb/lb-mole  
Test length (t): 118.52 minutes  
D<sub>p</sub>: 10.0 microns

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Stack gas viscosity:

$$\mu = -150.3162 + \left( 13.4622 \times \sqrt{(T_s + 460)} \right) + \left( 3.86153 \times 10^{-6} \times (T_s + 460)^3 \right) + \left( 0.591123 \times (\%O_{2,wr}) \right) - \left( 91.9723 \times B_{ws} \right) + \left( 1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^2 \right)$$

= 280.9 micropoise

### Sample flow rate @ standard conditions:

$$Q_{s,St} = \frac{V_{mstd}}{t} = 0.331 \text{ dscfm}$$

### Sample flow rate through PM<sub>10</sub> cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{s,St} \times \left( \frac{1}{(1 - B_{ws})} \right) \times \left( \frac{(T_s + 460)}{P_s} \right)$$

= 0.970 cfm

### Calculated Reynolds Number

$$N_{re} = 8.54 \times 10^3 \times \left( \frac{P_s \times M_s}{(T_s + 460)} \right) \times \left( \frac{Q_s}{\mu} \right)$$

= 2176

### Cunningham Correction Factor

$$C = 1 + 0.0057103 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{(T_s + 460)}{M_s} \right)^{0.55} \right)$$

= 1.035

### D<sub>50</sub> cutpoint (for Cyclone I):

$$D_{50} = \left( 0.15625 \times \left( \frac{(T_s + 460)}{(M_s \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_s} \right)^{0.7091}$$

= 9.295 μm

- 9 -

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 600  
TEST DATE: 12/11/13  
RUN NUMBER: PM-2

**Data Input:**

$V_m$ :	37.005	ft <sup>3</sup>	$Q_s$ :	123,808	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	644.3	°F
$P_{bar}$ :	29.60	in.Hg	Runtime:	118.52	minutes
$\Delta H$ :	0.37	in.H <sub>2</sub> O	$V_s$ :	120.327	ft/sec
$T_m$ :	33.5	°F	$P_s$ :	29.51	in.Hg
$V_{ic}$ :	318.5	mL	Noz. diam:	0.150	inches
N:	0.0992		$m_{ib}$ :	0.00	mg
$V_t$ :	4.79	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	56.85	mg			
$m_o$ :	0.70	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

**Volume of sample at standard conditions:**

$$V_{mstd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 39.205 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 8.09 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{ib} + m_{ob} = 0.00 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 48.76 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 49.46 \text{ mg}$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/11/2013  
Run #: PM-2

## Data Input

Barometric pressure (P <sub>ba</sub> ):	29.60 Inches Hg	Particulate Weight:	
Stack pressure (P <sub>s</sub> ):	29.51 Inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	13.85 milligrams
Test length (t):	118.52 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	0.20 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1500 Inches		
Sample nozzle area (A <sub>n</sub> ):	0.000123 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>1</sub> , (Container 4) (Rinse)	0.95 milligrams
Stack temperature (T <sub>s</sub> ):	644.3 °F	Total PM <sub>10</sub> front half:	14.80 milligrams
Volume metered (V <sub>mstd</sub> ):	39.204 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	120.327 feet/second	Total PM front half	15.00 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	7,428,452 dscf/hour	Total corrected PM <sub>10</sub> back half:	49.46 milligrams
Fractional Moisture content (B <sub>wa</sub> ):	0.2766		
Coke Burn Rate (R <sub>c</sub> ):	31,851 lb/hr	Total PM <sub>10</sub> weight (M <sub>a</sub> ):	64.26 milligrams
		Total PM weight (M <sub>a</sub> ):	64.46 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wa})} = 109.5 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = \begin{aligned} &= 0.0254 \text{ total PM gr/dscf} \\ &= 0.0001 >PM_{10} \text{ gr/dscf} \\ &= 0.0058 \text{ filterable PM}_{10} \text{ gr/dscf} \\ &= 0.0195 \text{ condensible PM}_{10} \text{ gr/dscf} \\ &= 0.0253 \text{ PM}_{10} \text{ gr/dscf} \end{aligned}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = \begin{aligned} &= 58.063 \text{ total PM mg/dscm} \\ &= 0.180 >PM_{10} \text{ mg/dscm} \\ &= 13.332 \text{ filterable PM}_{10} \text{ mg/dscm} \\ &= 44.551 \text{ condensible PM}_{10} \text{ mg/dscm} \\ &= 57.883 \text{ PM}_{10} \text{ mg/dscm} \end{aligned}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = \begin{aligned} &= 3.625 \times 10^{-6} \text{ total PM lb/dscf} \\ &= 0.011 \times 10^{-6} >PM_{10} \text{ lb/dscf} \\ &= 0.832 \times 10^{-6} \text{ filterable PM}_{10} \text{ lb/dscf} \\ &= 2.782 \times 10^{-6} \text{ condensible PM}_{10} \text{ lb/dscf} \\ &= 3.614 \times 10^{-6} \text{ PM}_{10} \text{ lb/dscf} \end{aligned}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate:

$$E_p = C_s^1 \times Q_{std} = \begin{aligned} &= 26.931 \text{ total PM lb/hr} \\ &= 0.084 >PM_{10} \text{ lb/hr} \\ &= 6.163 \text{ filterable PM}_{10} \text{ lb/hr} \\ &= 20.664 \text{ condensible PM}_{10} \text{ lb/hr} \\ &= 26.847 \text{ PM}_{10} \text{ lb/hr} \end{aligned}$$

$$\text{pm}_{\text{lb}/1000\text{lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = \begin{aligned} &= 0.846 \text{ total PM lb/1000lb coke burn} \\ &= 0.003 >PM_{10} \text{ lb/1000lb coke burn} \\ &= 0.194 \text{ filterable PM}_{10} \text{ lb/1000lb coke burn} \\ &= 0.849 \text{ condensible PM}_{10} \text{ lb/1000 coke burn} \\ &= 0.843 \text{ PM}_{10} \text{ lb/1000 coke burn} \end{aligned}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-3

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.4 %
Oxygen (O <sub>2</sub> ):	2.6 %
Nitrogen (N <sub>2</sub> ):	80.0 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2458
Stack Temperature (T <sub>s</sub> ):	642.1 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.3720 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.64 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.20 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.888 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.720 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.552 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 114.276 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 344,649 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 163,086 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 9,785,157 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 122,993 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,379,561 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-3

## Data Input:

Volume metered ( $V_m$ ):	36.025 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.000 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.64 inches Hg
Meter sample rate ( $\Delta H$ ):	0.37 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	35.7 °F
Volume of moisture collected ( $V_{lc}$ ):	263.5 milliliters
Stack Temperature ( $T_s$ ):	642.1 °F
Static Pressure ( $St$ ):	-1.2 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 38.048 \text{ dscf}$$

### Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 12.403 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = 0.2458 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 24.58 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 612.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 752.89 \text{ mm Hg}$$

$$B_{ws} = \frac{\sqrt[10]{10^{\left( A \times \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}}{P_{s(\text{mmHg})}}$$

where:  
A= 8.361  
B=1893.5  
C=27.65

$$= 1.0000$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{saturated} = B_{ws} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$\% \text{moisture} = B_{wo} \times 100 = 24.58 \%$$



Z =  $\frac{P - P_{atm}}{P_{atm}}$   
D<sub>50</sub>

## USEPA Method 201A PM<sub>2.5</sub> Emissions D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-3

### Data Input

Stack temperature (T <sub>s</sub> ):	642.1 °F
Fractional Moisture content (B <sub>ws</sub> ):	0.2458 %
Oxygen (O <sub>2</sub> ):	2.600 %
Stack pressure (P <sub>s</sub> ):	29.55 inches Hg Abs.
Volume metered (V <sub>mstd</sub> ):	38.048 dscf
Volume of water vapor (V <sub>wstd</sub> ):	12.403 scf
Molecular weight of gas, wet basis (M <sub>w</sub> ):	27.720 lb/lb-mole
Test length (θ):	118.86 minutes
D <sub>p</sub> :	10.0 microns

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Stack gas viscosity:

$$\mu = 150.3162 + \left( 13.4622 \times \sqrt{(T_s + 460)} \right) + \left( 3.86153 \times 10^{-5} \times (T_s + 460)^{-1} \right) + \left( 0.591123 \times (\%O_{2,ws}) \right) - \left( 91.9723 \times B_{ws} \right) + \left( 1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^2 \right)$$

= 282.9 micropoise

#### Sample flow rate @ standard conditions:

$$Q_{sstd} = \frac{V_{mstd}}{\theta} = 0.320 \text{ dscfm}$$

#### Sample flow rate through PM<sub>10</sub> cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sstd} \times \left( \frac{1}{(1 - B_{ws})} \right) \times \left( \frac{(T_s + 460)}{P_s} \right) = 0.897 \text{ cfm}$$

#### Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_w}{(T_s + 460)} \right) \times \left( \frac{Q_s}{\mu} \right) = 2037$$

#### Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \frac{(T_s + 460)}{M_w} \right)^{0.59} = 1.035$$

#### D<sub>50</sub> cutpoint (for Cyclone I):

$$D_{50} = \left( 0.15625 \times \left( \frac{(T_s + 460)}{(M_w \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_s} \right)^{2.091} = 9.832 \mu\text{m}$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 600  
TEST DATE: 12/12/13  
RUN NUMBER: PM-3

**Data Input:**

$V_m$ :	36.025	ft <sup>3</sup>	$Q_s$ :	122,993	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	642.1	°F
$P_{bar}$ :	29.64	in.Hg	Runtime:	118.86	minutes
$\Delta H$ :	0.37	in.H <sub>2</sub> O	$V_s$ :	114.276	ft/sec
$T_m$ :	35.7	°F	$P_s$ :	29.55	in.Hg
$V_{lc}$ :	263.5	mL	Noz. diam:	0.150	inches
$N$ :	0.0992		$m_{ib}$ :	0.00	mg
$V_t$ :	4.26	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	65.00	mg			
$m_o$ :	0.85	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

**Volume of sample at standard conditions:**

$$V_{std} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 38.048 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 7.20 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{ib} + m_{ob} = 0.00 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 57.80 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 58.65 \text{ mg}$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-3

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.64 Inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.55 Inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	10.90 milligrams
Test length (t):	118.88 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	0.90 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1500 Inches		
Sample nozzle area (A <sub>n</sub> ):	0.000123 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>1</sub> , (Container 4) (Rinse)	10.20 milligrams
Stack temperature (T <sub>s</sub> ):	642.1 °F	Total PM <sub>10</sub> front half:	21.10 milligrams
Volume metered (V <sub>mstd</sub> ):	38.048 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	114.276 feet/second	Total PM front half	22.00 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	7,379,561 dscf/hour	Total corrected PM <sub>10</sub> back half:	58.65 milligrams
Fractional Moisture content (B <sub>wo</sub> ):	0.2458		
Coke Burn Rate (R <sub>c</sub> ):	34,031 lb/hr	Total PM <sub>10</sub> weight (M <sub>n</sub> ):	79.75 milligrams
		Total PM weight (M <sub>n</sub> ):	80.65 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times 0 \times A_n \times (1 - B_{wo})} = 106.7 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left( \frac{0.01543 \text{ grains}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.0327 \text{ total PM gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0004 \text{ >PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0086 \text{ filterable PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0238 \text{ condensible PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.0323 \text{ PM}_{10} \text{ gr/dscf}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 74.860 \text{ total PM mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 0.835 \text{ >PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 19.584 \text{ filterable PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 54.440 \text{ condensible PM}_{10} \text{ mg/dscm}$$

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 74.024 \text{ PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 4.674 \times 10^{-6} \text{ total PM lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 0.052 \times 10^{-6} \text{ >PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 1.223 \times 10^{-6} \text{ filterable PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 3.399 \times 10^{-6} \text{ condensible PM}_{10} \text{ lb/dscf}$$

$$E_p = \frac{\left( \frac{2.205 \times 10^{-6} \text{ lb}}{\text{mg}} \times M_n \right)}{V_{mstd}} = 4.622 \times 10^{-6} \text{ PM}_{10} \text{ lb/dscf}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/Hr):

$$E_p = C_s \times Q_{std} = 34.493 \text{ total PM lb/hr}$$

$$E_p = C_s \times Q_{std} = 0.385 \text{ >PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 9.024 \text{ filterable PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 25.084 \text{ condensible PM}_{10} \text{ lb/hr}$$

$$E_p = C_s \times Q_{std} = 34.108 \text{ PM}_{10} \text{ lb/hr}$$

$$PM_{10} \text{ lb}/1000 \text{ lb coke burn} = \frac{(E_p)(1000)}{(R_c)} = 1.014 \text{ total PM lb}/1000 \text{ lb coke burn}$$

$$PM_{10} \text{ lb}/1000 \text{ lb coke burn} = \frac{(E_p)(1000)}{(R_c)} = 0.011 \text{ >PM}_{10} \text{ lb}/1000 \text{ lb coke burn}$$

$$PM_{10} \text{ lb}/1000 \text{ lb coke burn} = \frac{(E_p)(1000)}{(R_c)} = 0.265 \text{ filterable PM}_{10} \text{ lb}/1000 \text{ lb coke burn}$$

$$PM_{10} \text{ lb}/1000 \text{ lb coke burn} = \frac{(E_p)(1000)}{(R_c)} = 0.737 \text{ condensible PM}_{10} \text{ lb}/1000 \text{ lb coke burn}$$

$$PM_{10} \text{ lb}/1000 \text{ lb coke burn} = \frac{(E_p)(1000)}{(R_c)} = 1.002 \text{ PM}_{10} \text{ lb}/1000 \text{ lb coke burn}$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-4

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	17.5 %
Oxygen (O <sub>2</sub> ):	2.6 %
Nitrogen (N <sub>2</sub> ):	79.9 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2640
Stack Temperature (T <sub>s</sub> ):	644.3 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.3691 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.64 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.10 inches H <sub>2</sub> O
Stack diameter:	96.00 inches H <sub>2</sub> O
Stack area (A <sub>s</sub> ):	50.2655 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.904 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 27.497 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.559 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 114.593 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 345,603 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 163,257 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 9,795,448 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) = 120,159 \text{ dscfm}$$

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60 = 7,209,535 \text{ dscfh}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-4

## Data Input:

Volume metered (V <sub>m</sub> ):	36.035 ft <sup>3</sup>
Meter calibration coefficient (Y <sub>d</sub> ):	1.000 dimensionless
Barometric pressure (P <sub>bar</sub> ):	29.64 inches Hg
Meter sample rate (ΔH):	0.37 inches H <sub>2</sub> O
Meter inlet/outlet temperature (T <sub>m</sub> ):	33.0 °F
Volume of moisture collected (V <sub>lc</sub> ):	291.6 milliliters
Stack Temperature (T <sub>s</sub> ):	644.3 °F
Static Pressure (St):	-1.1 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92 \text{ in Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 38.267 \text{ dscf}$$

### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 13.726 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2640 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 26.40 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(^\circ K)} = ((T_s - 32) \times 0.5556) + 273 = 613.2 \text{ }^\circ \text{Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 752.89 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt{10^{\left( A \left( \frac{B}{(T_{s(^\circ K)} - C)} \right) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 1.0000$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$\% \text{moisture} = B_{wo} \times 100 = 26.40 \%$$

ARI Environmental Inc.  
USEPA Method 202  
Condensible Particulate Calculation Summary

COMPANY: BP  
LOCATION: Whiting, In  
SOURCE: FCCU 600  
TEST DATE: 12/12/13  
RUN NUMBER: PM-4

**Data Input:**

$V_m$ :	36.035	ft <sup>3</sup>	$Q_s$ :	120,159	dscfm
$\gamma$ FACTOR:	1		$T_s$ :	644.3	°F
$P_{bar}$ :	29.64	in.Hg	Runtime:	119.09	minutes
$\Delta H$ :	0.37	in.H <sub>2</sub> O	$V_s$ :	114.593	ft/sec
$T_m$ :	33	°F	$P_s$ :	29.56	in.Hg
$V_{lc}$ :	291.6	mL	Noz. diam:	0.150	inches
$N$ :	0.0992		$m_{lb}$ :	0.00	mg
$V_t$ :	3.12	mL	$m_{ob}$ :	0.00	mg
$m_r$ :	60.50	mg			
$m_o$ :	1.75	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

**Volume of sample at standard conditions:**

$$V_{msd} = \left( \frac{528}{29.92} \right) \times V_m \times \gamma \left[ \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 38.267 \text{ dscf}$$

**Mass of ammonia correction:**

$$m_c = 17.03 \times V_T \times N = 5.27 \text{ mg}$$

**Mass of the field blank:**

$$m_{fb} = m_{lb} + m_{ob} = 0.00 \text{ mg}$$

**Mass of inorganic condensible PM:**

$$m_i = m_r - m_c = 55.23 \text{ mg}$$

**Total mass of condensible PM:**

$$m_{cpm} = m_i + m_o - m_{fb} = 56.98 \text{ mg}$$



# USEPA Method 201A PM<sub>2.5</sub> Emissions D<sub>50</sub> Cutpoint Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-4

## Data Input

Stack temperature (T <sub>s</sub> ):	644.3 °F
Fractional Moisture content (B <sub>ws</sub> ):	0.2640 %
Oxygen (O <sub>2</sub> ):	2.600 %
Stack pressure (P <sub>s</sub> ):	29.56 Inches Hg Abs.
Volume metered (V <sub>m,td</sub> ):	38.267 dscf
Volume of water vapor (V <sub>w,td</sub> ):	13.726 scf
Molecular weight of gas, wet basis (M <sub>s</sub> ):	27.497 lb/lb-mole
Test length (θ):	119.09 minutes
D <sub>p</sub> :	10.0 microns

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Stack gas viscosity:

$$\mu = -150.3162 + \left( 13.4622 \times \sqrt{\left( \frac{T_s + 460}{1} \right)} \right) + \left( 3.86153 \times 10^{-5} \times (T_s + 460)^2 \right) + \left( 0.591123 \times (\%O_{2,ws}) \right) - \left( 91.9723 \times B_{ws} \right) + \left( 1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^2 \right) = 281.9 \text{ micropoise}$$

### Sample flow rate @ standard conditions:

$$Q_{s,ST} = \frac{V_{m,std}}{\theta} = 0.321 \text{ dscfm}$$

### Sample flow rate through PM<sub>10</sub> cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{s,ST} \times \left( \frac{1}{(1 - B_{ws})} \right) \times \left( \frac{T_s + 460}{P_s} \right) = 0.924 \text{ cfm}$$

### Calculated Reynolds Number

$$N_{Re} = 8.64 \times 10^5 \times \left( \frac{P_s \times M_s}{(T_s + 460)} \right) \times \left( \frac{Q_s}{\mu} \right) = 2085$$

### Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left( \frac{\mu}{P_s \times D_p} \right) \times \left( \left( \frac{T_s + 460}{M_s} \right)^{1.50} \right) = 1.035$$

### D<sub>50</sub> cutpoint (for Cyclone I):

$$D_{50} = \left( 0.15625 \times \left( \frac{T_s + 460}{(M_s \times P_s)} \right)^{0.2091} \right) \times \left( \frac{\mu}{Q_s} \right)^{0.7091} = 9.623 \text{ }\mu\text{m}$$



# USEPA Method 201A PM10 Emissions Particulate Calculation Summary

Client: BP  
Location: Whiting, In  
Source: FCCU 600  
Date: 12/12/2013  
Run #: PM-4

## Data Input

Barometric pressure ( $P_{bar}$ ):	29.64 Inches Hg	Particulate Weight:	
Stack pressure ( $P_s$ ):	29.56 Inches Hg Abs.	<PM <sub>10</sub> M <sub>1</sub> , (Container 1) (Filterable)	20.50 milligrams
Test length (t):	119.09 minutes	>PM <sub>10</sub> M <sub>2</sub> , (Container 2)	0.15 milligrams
Sample nozzle diameter (D <sub>n</sub> ):	0.1500 inches		
Sample nozzle area (A <sub>n</sub> ):	0.000123 ft <sup>2</sup>	<PM <sub>10</sub> M <sub>1</sub> , (Container 4) (Rinse)	1.70 milligrams
Stack temperature (T <sub>s</sub> ):	644.3 °F	Total PM <sub>10</sub> front half:	22.20 milligrams
Volume metered (V <sub>mstd</sub> ):	38.267 ft <sup>3</sup>		
Stack gas velocity (V <sub>s</sub> ):	114.593 feet/second	Total PM front half	22.35 milligrams
Stack gas volumetric flow (Q <sub>std</sub> ):	7,209,535 dscf/hour	Total corrected PM <sub>10</sub> back half:	56.98 milligrams
Fractional Moisture content (B <sub>wa</sub> ):	0.2640		
Coke Burn Rate (R <sub>c</sub> ):	32,685 lb/hr	Total PM <sub>10</sub> weight (M <sub>1</sub> ):	79.18 milligrams
		Total PM weight (M <sub>1</sub> ):	79.33 milligrams (>PM <sub>10</sub> + PM <sub>10</sub> )

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Percent Isokinetic:

$$\% \text{Isokinetic} = \frac{0.0945 \times V_{mstd} \times (T_s + 460)}{P_s \times V_s \times t \times A_n \times (1 - B_{wa})} = 109.6 \% \text{ isokinetic}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/dscf):

$$C_p = \frac{(0.01543 \text{ grains} \times M_n)}{V_{mstd}} = 0.0320 \text{ total PM gr/dscf}$$

$$C_p = 0.0001 > \text{PM}_{10} \text{ gr/dscf}$$

$$C_p = 0.0090 \text{ filterable PM}_{10} \text{ gr/dscf}$$

$$C_p = 0.0230 \text{ condensible PM}_{10} \text{ gr/dscf}$$

$$C_p = 0.0319 \text{ PM}_{10} \text{ gr/dscf}$$

$$C_p = \frac{M_n}{V_{mstd}} \times \frac{35.315 \text{ ft}^3}{\text{m}^3} = 73.209 \text{ total PM mg/dscm}$$

$$C_p = 0.138 > \text{PM}_{10} \text{ mg/dscm}$$

$$C_p = 20.487 \text{ filterable PM}_{10} \text{ mg/dscm}$$

$$C_p = 52.584 \text{ condensible PM}_{10} \text{ mg/dscm}$$

$$C_p = 73.071 \text{ PM}_{10} \text{ mg/dscm}$$

$$E_p = \frac{(2.205 \times 10^{-6} \text{ lb} \times M_n)}{V_{mstd}} = 4.571 \times 10^{-6} \text{ total PM lb/dscf}$$

$$E_p = 0.009 \times 10^{-6} > \text{PM}_{10} \text{ lb/dscf}$$

$$E_p = 1.279 \times 10^{-6} \text{ filterable PM}_{10} \text{ lb/dscf}$$

$$E_p = 3.283 \times 10^{-6} \text{ condensible PM}_{10} \text{ lb/dscf}$$

$$E_p = 4.562 \times 10^{-6} \text{ PM}_{10} \text{ lb/dscf}$$

### PM<sub>10</sub>, PM<sub>2.5</sub>, and Total Particulate emission rate (lb/Hr):

$$E_p = C_p \times Q_{std} = 32.955 \text{ total PM lb/hr}$$

$$E_p = 0.062 > \text{PM}_{10} \text{ lb/hr}$$

$$E_p = 9.222 \text{ filterable PM}_{10} \text{ lb/hr}$$

$$E_p = 23.670 \text{ condensible PM}_{10} \text{ lb/hr}$$

$$E_p = 32.693 \text{ PM}_{10} \text{ lb/hr}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = \frac{(E_p)(1000)}{(R_c)} = 1.008 \text{ total PM lb/1000lb coke burn}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = 0.002 > \text{PM}_{10} \text{ lb/1000lb coke burn}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = 0.282 \text{ filterable PM}_{10} \text{ lb/1000lb coke burn}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = 0.724 \text{ condensible PM}_{10} \text{ lb/1000lb coke burn}$$

$$\text{pmr}_{\text{lb/1000lb coke burn}} = 1.006 \text{ PM}_{10} \text{ lb/1000lb coke burn}$$



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX B**

## **Field Data**

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TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting  
Date 5/20/13  
Sampling Location FCCU 600  
Inside of Far Wall to  
Outside of Port (Distance C) 107.75 in.  
Inside of Near Wall to  
Outside of Port (Distance D) 11.75 in.  
Stack ID (Distance C - Distance D) 96 in.  
Port Distance Downstream From Disturbance (B) 840 in.  
Port Distance Upstream From Disturbance (A) 980 in.  
Equivalent Diameter Downstream From Disturbance (B) 8.8 (≥ 2.0)  
Equivalent Diameter Upstream From Disturbance (A) 5.0 (≥ 0.5)  
Number of Ports Used 2 Traverse Points / Port 6

1 2 3 4 5 6

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	96	4.22	11.75	15.97
2	0.146		14.01		25.76
3	0.296		28.41		40.16
4	0.704		67.58		79.33
5	0.854		81.98		93.73
6	0.956		91.77		103.52
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID - No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:

Completeness \_\_\_\_\_ Legibility \_\_\_\_\_ Accuracy \_\_\_\_\_ Specifications \_\_\_\_\_

Method 1 Calculator Signature/Date

By: [Signature] 5/20/13

Field Supervisor Signature/Date

BB-1

Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) =  
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) =  
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =  
[(2 x L x W) / (L + W)]

Port ID 5 in. (for monorail bracket specs.)  
Port Length Outside of Stack 4 in. (for monorail bracket specs.)

outer insulation  
6" Bracket w/ spacing shims or c-clamps  
use FCCU 600 Boards

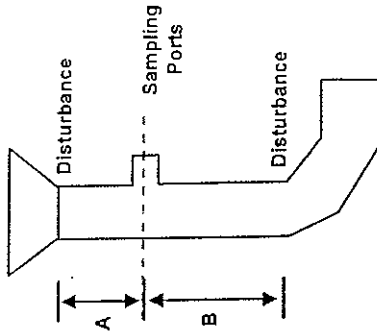
LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

PTS	4	6	8	10	12
1	6.7	14.4	3.2	2.8	2.1
2	25.0	74.8	10.5	8.2	6.7
3	75.0	229.8	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5	165.4	67.7	34.2	25.0	
6	95.8	80.8	68.8	35.8	
7	89.5	77.4	84.4		
8	98.8	85.4	75.0		
9		91.8	82.3		
10		97.4	88.2		
11			93.3		
12			97.9		

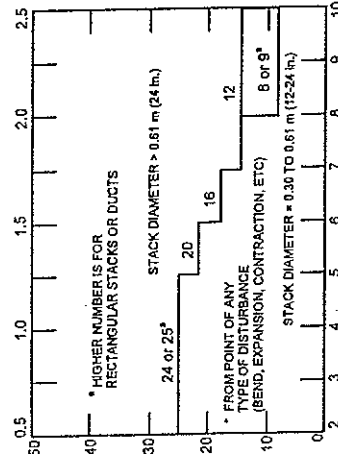
LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

PTS	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3	83.3	62.5	50.0	41.7	35.7	31.3	27.8	
4		87.5	70.0	58.3	50.0	43.8	38.9	
5			90.0	75.0	64.3	56.3	50.0	
6				91.7	78.8	68.6	61.1	
7					92.9	81.3	72.2	
8						93.8	83.3	
9							84.4	

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)



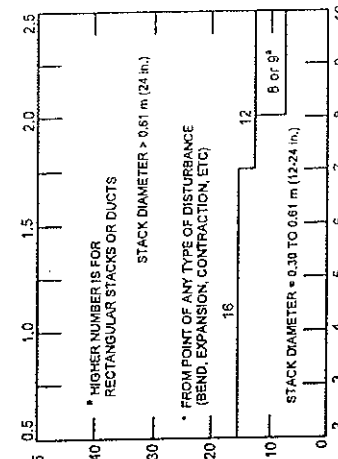
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

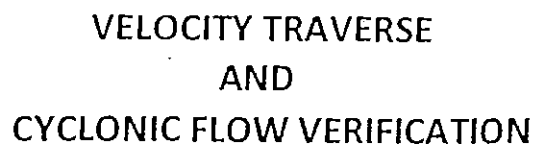
MINIMUM NUMBER OF TRAVERSE POINTS FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS FOR VELOCITY (NON-ISOKINETIC) TRAVERSES



### SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. \_\_\_\_\_  
 STATIC, in. H<sub>2</sub>O \_\_\_\_\_  
 START: \_\_\_\_\_ STOP: \_\_\_\_\_  
 PRE-TEST: \_\_\_\_\_ POST-TEST: \_\_\_\_\_

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			



# FIELD DATA

PLANT	DATE	12-11-13	PROBE HEATER SETTING	250
LOCATION	OPERATOR	WAW	HEATER BOX SETTING	250
STACK NO.	STACK LENGTH, in.	38	METER H <sub>2</sub> O	1.93
RUN NO.	NOZZLE DIAMETER, in.	1.00	C <sub>p</sub> FACTOR	0.84
SAMPLE BOX NO.	STACK DIAMETER, in.	6.0	Y <sub>d</sub> FACTOR	1.00
METER BOX NO.	MINUTES PER POINT	0.15	PITOT NO.	204
START TIME	NUMBER OF PORTS	11:52		

WEIGHT OF PARTICULATE, mg	
Filter No.	5-131
Sample	
Final wt	
Tare wt	
Wt gain	
TOTAL	
mg	

CLOCK TIME (hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (in. H <sub>2</sub> O)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H <sub>2</sub> O		GAS SAMPLE VOLUME (Nm <sup>3</sup> )	GAS SAMPLE DRY GAS-METER		FILTER EXIT GAS TEMP. (°F)	PROBE TEMP. (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
						ACTUAL	DESIRED		INLET (T <sub>in</sub> ) (°F)	OUTLET (T <sub>out</sub> ) (°F)					
11:50	1	0	-1.2	648	2.0	0.37		830.580	34		251	250	69	29	2
11:51	2	0.40		645	2.1	0.37		833.51	37		252	252	70	30	2
11:52	3	0.40		646	2.2	0.37		836.62	38		253	251	70	32	2
11:53	4	0.40		647	2.1	0.37		840.03	38		251	255	71	31	2
11:54	5	0.40		647	2.0	0.37		843.19	38		251	253	70	31	2
11:55	6	0.40		648	2.0	0.37		846.26	37		253	252	71	30	2
11:56	7	0.40		647	2.1	0.37		849.20	36		251	250	70	30	2
11:57	8	0.40		647	2.1	0.37		852.21	36		250	252	71	30	2
11:58	9	0.40		647	2.1	0.37		855.25	36		252	251	71	30	2
11:59	10	0.40		648	2.1	0.37		858.35	35		253	250	72	29	2
12:00	11	0.40		648	2.0	0.37		861.42	36		251	251	72	30	2
12:01	12	0.40		647	1.9	0.37		864.40	35		251	253	71	30	2
AVERAGE	12	118.66	-1.22	646.4	1.9315	0.37		867.555	36.3		250	250	70.5	29.5	

VOLUME OR WEIGHT OF LIQUID COLLECTED		IMPINGER		SILICA GEL WEIGHT	
#1	#2	#3	#4	#5	
618.9	622.6	646.5	56	925.3	
367.1	592.5	643.7	56	915.8	
251.8	30.1	32.45		9.5	
TOTAL LIQUID COLLECTED (specify ml or g)		2946.1			

ORISAT DATA	CVR		02	
TRIAL 1	17.1	2.2		
TRIAL 2	17.1	2.2		
TRIAL 3	17.1	2.2		
Average	17.1	2.2		

LEAK CHECK	
SYSTEM PRE: 60.0	CFM @ 15" H <sub>2</sub> O
POST: 60.0	CFM @ 15" H <sub>2</sub> O
PITOT PRE: 31.0	
POST: 31.0	



# FIELD DATA

PLANT BP  
DATE 11/13  
LOCATION 600-202-2  
OPERATOR BP  
STACK NO. 600  
RUN NO. 600-202-2  
SAMPLE BOX NO. 600-202-2  
METER BOX NO. 600-202-2  
START TIME 1410

AMBIENT TEMPERATURE  
BAROMETRIC PRESSURE  
ASSUMED MOISTURE, %  
PROBE LENGTH, in.  
NOZZLE DIAMETER, in.  
STACK DIAMETER, in.  
MINUTES PER POINT  
NUMBER OF PORTS

PROBE HEATER SETTING  
HEATER BOX SETTING  
METER Hg  
C<sub>p</sub> FACTOR  
Y<sub>d</sub> FACTOR  
PITOT NO.

WEIGHT OF PARTICULATE, mg  
Filter No. 5-162  
Sample  
Final wt.  
Tare wt.  
Wt. gain

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Hrs)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (AP <sub>3</sub> )	VELOCITY (ft/min)	DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)	GAS SAMPLE VOLUME (V <sub>m</sub> ) ft <sup>3</sup>	GAS SAMPLE DRY GAS METER INLET (T <sub>m</sub> ) °F	GAS SAMPLE DRY GAS METER OUTLET (T <sub>m</sub> ) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
14:10	1	0	-1.2	644	2.0	1430	0.37	888.85	35	35	231	252	69	25	2
14:14	2	9.76		644	2.1	1430		872.00	35	35	235	251	69	26	2
14:20	3	11.76		645	2.1	1430		875.10	34	34	237	250	70	26	2
14:26	4	13.76		647	2.2	1430		878.23	34	34	236	250	71	27	2
14:30	5	15.99		645	2.1	1430		881.41	33	33	235	251	71	28	2
14:36	6	18.00		642	2.0	1430		884.55	33	33	236	251	72	28	2
14:40	1	19.75		642	1.9	1430		887.54	33	33	237	252	70	26	2
14:46	2	21.26		644	2.0	1430		890.52	33	33	237	251	70	27	2
14:52	3	23.01		645	2.1	1430		893.32	33	33	237	251	70	27	2
14:58	4	24.61		647	2.1	1430		896.43	33	33	237	251	71	27	2
15:04	5	26.01		645	2.1	1430		899.53	33	33	237	250	72	28	2
15:10	6	27.61		644	1.9	1430		902.77	32	32	237	250	71	27	2
15:16	1	29.32						905.30							
AVERAGE	12	18.52	-1.2	644.3	2.0	1430		897.055	33.5	33.5	236	250	68.5	26.5	2

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)	#1	#2	#3	#4	#5	SILICA GEL WEIGHT
FINAL	619.7	691.6	681.1	56	56	-	909.4
INITIAL	390.0	618.0	671.9	56	56	-	903.4
LIQUID COLLECTED	229.7	73.6	92				6.0
TOTAL LIQUID COLLECTED (Specify ml or g)							318.5

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		17.3	2.5
TRIAL 2		17.3	2.5
TRIAL 3		17.3	2.5
Average		17.3	2.5

LEAK CHECK	SYSTEM PRE: 2.5 CFM @ 15" Hg
POST: 2.5	CFM @ 15" Hg
PITOT PRE: 71.0	@ 3" H <sub>2</sub> O
POST: 71.0	@ 3" H <sub>2</sub> O



## FIELD DATA

### CROSS SECTION

LEAK CHECK

SYSTEM PRE: 00 CFM@15"Hg

POST: 00 CFM@15"Hg

PITOT PRE: 7/10/20 @ 3"H<sub>2</sub>O

POST: 4/10/20 @ 3"H<sub>2</sub>O

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		17.4	2.6
TRIAL 2		17.4	2.6
TRIAL 3		17.4	2.6
Average		17.4	2.6

VOLUME OR WEIGHT OF LIQUID COLLECTED		IMPINGER				SILICA GEL WEIGHT
		VOLUME (ml) OR WEIGHT (g)				
	#1	#2	#3	#4	#5	
FINAL	538.7	670.2	653.5	8.58	-	855.2 g
INITIAL	368.5	594.2	646.5	50	-	844.9
LIQUID COLLECTED	170.2	76.0	7.0			10.3
TOTAL LIQUID COLLECTED (specify ml or g)	568.5 ✓					

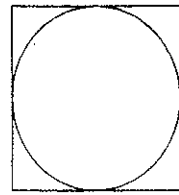


# FIELD DATA

B-6

PLANT BR AMBIENT TEMPERATURE  
DATE 12-13-17 BAROMETRIC PRESSURE  
LOCATION WATER PUMP IN ASSUMED MOISTURE, %  
OPERATOR ST PROBE LENGTH, in.  
STACK NO. 100-400 NOZZLE DIAMETER, in.  
RUN NO. 100-302-4 STACK DIAMETER, in.  
SAMPLE BOX NO. 100-302-4 MINUTES PER POINT  
METER BOX NO. 601617 NUMBER OF POINTS  
START TIME 1330 NUMBER OF PORTS

PROBE HEATER SETTING 250  
HEATER BOX SETTING 250  
METER H<sub>2</sub>O 1.67  
C<sub>2</sub> FACTOR 801  
V<sub>2</sub> FACTOR 1.000  
PITOT NO. 351



CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (°F)	VELOCITY HEAD (AP) (ft)	VELOCITY (ft/min)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (in. H <sub>2</sub> O)		GAS SAMPLE VOLUME (Nm <sup>3</sup> )	GAS SAMPLE TEMPERATURE (°F)		FILTER EXIT GAS TEMP. (°F)	PROBE TEMP (°F)	AUXILIARY TEMP. (°F)	LAST IMPINGER OUTLET TEMP. (°F)	PUMP VACUUM (in. Hg)
							ACTUAL	DESIRED		DRY GAS METER INLET (T <sub>in</sub> )	OUTLET (T <sub>out</sub> )					
1330-00	1	0	-1.1	642	1.8		0.37		143.150	34		201	250	651	27	2
1350-45	2	0.73		643	1.9		0.37		148.05	34		254	251	71	28	2
1400-45	3	1.47		646	1.9		0.37		149.05	35		253	250	72	28	2
1410-45	4	2.91		647	2.0		0.37		153.01	35		254	251	73	30	2
1430-00	5	3.96		646	1.9		0.37		155.12	33		256	251	73	29	2
1440-00	6	4.95		643	1.8		0.37		158.21	33		257	252	73	28	2
1450-00/1457	7	5.67		640	1.8		0.37		161.19	33		256	251	70	27	2
1501-45	8	6.40		644	1.9		0.37		164.17	32		257	250	71	27	2
1511-45	9	7.35		645	2.0		0.37		167.19	32		256	250	71	28	2
1522-45	4	8.61		648	1.9		0.37		170.32	32		257	252	71	28	2
1532-40	5	9.63		646	1.8		0.37		173.30	32		253	250	70	27	2
1541-45	6	10.36		642	1.8		0.37		176.19	31		251	251	65	27	2
1551-30		11.09							179.155							
AVERAGE	12	119.09	-1.1	644.3	1.38	✓			16.635	33.0	✓	2250	2250	685	683	2

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL	593.4	691.8	685.2	56	-	913.4
INITIAL	390.8	619.2	681.1	56	-	902.1
LIQUID COLLECTED	202.6	72.6	5.1			11.3
TOTAL LIQUID COLLECTED (specify ml or g)	291.6					✓

ORISAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		17.5	2.6
TRIAL 2		17.5	2.6
TRIAL 3		17.5	2.6
Average		17.5	2.6

LEAK CHECK	SYSTEM PRE: 0.601 CFM@15"Hg
	POST: 3.001 CFM@15"Hg
	PITOT PRE: 17.5 CFM @ > 3"H <sub>2</sub> O
	POST: 17.5 CFM @ > 3"H <sub>2</sub> O



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX C**

## **Analytical Data**

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# ***ANALYTICAL REPORT***

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 12/11/13 & 12/12/13

Lab Project Number: 08-605

COC Numbers(s): W02252 – W02254

Analysis Date(s): 12/17 - 12/27/13

Analytical Method(s): USEPA Method 5, USEPA Method 201A & USEPA Method 202

***Prepared For:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Project Mgr: Steve Flaherty  
Phone: 847-487-1580 x117  
Fax: 847-487-1587  
E-mail: sflaherty@arienv.com

***Prepared By:***

ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, IL 60084  
Eric Vogt, Lab Manager  
Phone: 847-487-1580 ext.116  
Fax: 847-487-1587  
E-mail: evogt@arienv.com

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- The results and interpretations expressed in this report represent the best judgment of ARI Environmental, Inc.
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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5  
State of Louisiana LDEQ/LELAP Certificate ID: 02010  
State of New Jersey NJDEP Certification ID: IL007



## *Project Narrative*

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### ***Sample Receipt and Acceptance Quality Assurance:***

Thirty-one (31) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 12/16/13. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

### ***Analytical Quality Assurance:***

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

### ***Data Interpretation and Comments:***

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

### ***Scope of Accreditation:***

USEPA Method 5 and USEPA Method 202 analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP. USEPA Method 201A is not offered as an accredited method by TCEQ/NELAP.

### ***Laboratory Contact Information:***

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at [evogt@arienv.com](mailto:evogt@arienv.com).

Reviewed and Approved by:

  
\_\_\_\_\_  
Signature: Laboratory Manager

1/2/14  
Date



# ANALYTICAL SUMMARY

CLIENT: BP Whiting

LOCATION: Whiting, IN

SOURCE: FCU 600

SAMPLE DATE: 12/11/13 - 12/12/13

ANALYSIS: Particulates

METHOD: USEPA Methods M5/201A, M202

page 1 of 2

ANALYST: J. Ruggaber + E. Vogt

DATE OF COMPLETION: 12/31/2013

TEMPLATE CONTROL ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

PROJECT NUMBER: 08-605

M5/201A

Identification	LIMS Number	Solvent Mass (g)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Particulate (mg)	Blank Corrected Particulate (mg)
PM1 Filter	12415	-	867.7	869.6	869.9	-0.30	N/A	2.05	2.05
PM1 PW	12414	164.0	113980.3	113982.9	113982.9	0.00	N/A	2.60	2.60
PM1, >PM10	12413	42.2	112633.9	112634.2	112633.9	0.30	N/A	0.15	0.15
PM2 Filter	12421	-	882.4	896.2	896.3	-0.10	N/A	13.85	13.85
PM2 PW	12420	170.1	115840.3	115841.5	115841.0	0.50	N/A	0.95	0.95
PM2, >PM10	12419	39.2	114975.3	114975.7	114975.3	0.40	N/A	0.20	0.20
PM3 Filter	12427	-	878.1	888.8	889.2	-0.40	N/A	10.90	10.90
PM3 PW	12426	161.7	114545.5	114555.8	114555.6	0.20	N/A	10.20	10.20
PM3, >PM10	12425	49.5	125228.2	125229.2	125229.0	0.20	N/A	0.90	0.90
PM4 Filter	12433	-	882.6	902.9	903.3	-0.40	N/A	20.50	20.50
PM4 PW	12432	165.2	111383.6	111385.5	111385.1	0.40	N/A	1.70	1.70
PM4, >PM10	12431	89.2	119677.5	119677.7	119677.6	0.10	N/A	0.15	0.15
Acetone Blank	12437	158.3	102513.9	102512.5	102513.0	-0.50	N/A	<0.10	-

Identification	Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	% Accuracy	Pass/Fail
LCS	100	112940.0	113040.0	113040.4	-0.40	100.20	100.30	99.9	Pass

C-4 CLIENT: BP Whiting  
LOCATION: Whiting, IN  
SOURCE: FCU 600  
SAMPLE DATE: 12/11/13 - 12/12/13  
ANALYSIS: Particulates  
METHOD: USEPA Methods M5/201A, M202

page 2 of 2

ANALYST: J. Ruggaber + E. Vogt

DATE OF COMPLETION: 12/31/2013

TEMPLATE CONTROL ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

PROJECT NUMBER: 08-605

#### M202 Organic Rinse

Identification	LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Organic CPM (mg)
PM1	12417	111271.0	111271.2	111271.3	-0.10	N/A	0.25
PM2	12423	119906.2	119907.1	119906.7	0.40	N/A	0.70
PM3	12429	95052.5	95053.6	95053.1	0.50	N/A	0.85
PM4	12435	101170.0	101172.0	101171.5	0.50	N/A	1.75
Field Blank	12442	116625.2	116625.1	116624.9	0.20	N/A	<0.10
Acetone Blank	12439	110315.1	110315.0	110314.6	0.40	N/A	<0.10
Hexane Blank	12440	111425.7	111425.5	111425.1	0.40	N/A	<0.10

#### M202 Imp Contents

Identification	LIMS Number	mL of NH <sub>4</sub> OH added	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Inorganic CPM (mg)*
PM1	12416	4.19	114250.7	114322.2	114322.5	-0.30	N/A	71.65
PM2	12422	4.79	116037.3	116094.0	116094.3	-0.30	N/A	56.85
PM3	12428	4.26	114982.0	115046.9	115047.1	-0.20	N/A	65.00
PM4	12434	3.12	103074.5	103134.9	103135.1	-0.20	N/A	60.50
Field Blank	12441	0.08	114965.8	114964.8	114964.7	0.10	N/A	<0.10
DI Water Blank	12438	-	116794.5	116793.0	116793.0	0.00	N/A	<0.10

Ammonium Hydroxide Conc = 0.0992 N

\*Not Corrected for Ammonium Hydroxide titration



951 Old Rand Road # 106

Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID: FCU 600 Run PM-1 >PM-10 Catch  
Lab Sample #: 12413

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	12/31/2013	0.15	mg	

Sample ID: FCU 600 Run PM-1 Probe Wash  
Lab Sample #: 12414

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	2.60	mg	

Sample ID: FCU 600 Run PM-1 Filter  
Lab Sample #: 12415

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	2.05	mg	

Sample ID: FCU 600 Run PM-1 Inorganic Rinses  
Lab Sample #: 12416

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	71.65	mg	

Sample ID: FCU 600 Run PM-1 Organic Rinses  
Lab Sample #: 12417

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	0.25	mg	



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Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID:	FCU 600 Run PM-1 CPM Filter				Date Sampled:	12/11/2013
Lab Sample #:	12418				Field #:	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID:	FCU 600 Run PM-2 >PM-10 Catch				Date Sampled:	12/11/2013
Lab Sample #:	12419				Field #:	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	12/31/2013	0.20	mg	

Sample ID:	FCU 600 Run PM-2 Probe Wash				Date Sampled:	12/11/2013
Lab Sample #:	12420				Field #:	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	0.95	mg	

Sample ID:	FCU 600 Run PM-2 Filter				Date Sampled:	12/11/2013
Lab Sample #:	12421				Field #:	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	13.85	mg	

Sample ID:	FCU 600 Run PM-2 Inorganic Rinses				Date Sampled:	12/11/2013
Lab Sample #:	12422				Field #:	
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	56.85	mg	



951 Old Rand Road # 106  
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## ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID: FCU 600 Run PM-2 Organic Rinses  
Lab Sample #: 12423

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	0.70	mg	

Sample ID: FCU 600 Run PM-2 CPM Filter  
Lab Sample #: 12424

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Sample ID: FCU 600 Run PM-3 >PM-10 Catch  
Lab Sample #: 12425

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	12/31/2003	0.90	mg	

Sample ID: FCU 600 Run PM-3 Probe Wash  
Lab Sample #: 12426

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	10.20	mg	

Sample ID: FCU 600 Run PM-3 Filter  
Lab Sample #: 12427

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	10.90	mg	



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Wauconda, IL 60084



## ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID: FCU 600 Run PM-3 Inorganic Rinses  
Lab Sample #: 12428

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	65.00	mg	

Sample ID: FCU 600 Run PM-3 Organic Rinses  
Lab Sample #: 12429

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	0.85	mg	

Sample ID: FCU 600 Run PM-3 CPM Filter  
Lab Sample #: 12430

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Sample ID: FCU 600 Run PM-4 >PM-10 Catch  
Lab Sample #: 12431

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	12/31/2013	0.15	mg	

Sample ID: FCU 600 Run PM-4 Probe Wash  
Lab Sample #: 12432

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	1.70	mg	



951 Old Rand Road # 106

Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID:	FCU 600 Run PM-4 Filter			Date Sampled: 12/12/2013		
Lab Sample #:	12433			Field #:		
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	20.50	mg	

Sample ID:	FCU 600 Run PM-4 Inorganic Rinses			Date Sampled: 12/12/2013		
Lab Sample #:	12434			Field #:		
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	60.50	mg	

Sample ID:	FCU 600 Run PM-4 Organic Rinses			Date Sampled: 12/12/2013		
Lab Sample #:	12435			Field #:		
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	1.75	mg	

Sample ID:	FCU 600 Run PM-4 CPM Filter			Date Sampled: 12/12/2013		
Lab Sample #:	12436			Field #:		
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID:	FCU 600 M5/201A Acetone Blank			Date Sampled: 12/11/2013		
Lab Sample #:	12437			Field #:		
Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	12/31/2013	<0.10	mg	
Particulate	USEPA Method 5	Joel Ruggaber	12/31/2013	<0.10	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



Texas NELAP ID: T 104704428-12-4

## ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID: FCU 600 DI Water Blank  
Lab Sample #: 12438

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	<0.10	mg	

Sample ID: FCU 600 M202 Acetone Blank  
Lab Sample #: 12439

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	<0.10	mg	

Sample ID: FCU 600 M202 Hexane Blank  
Lab Sample #: 12440

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	<0.10	mg	

Sample ID: FCU 600 Field Blank Inorganic Rinses  
Lab Sample #: 12441

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	<0.10	mg	

Sample ID: FCU 600 Field Blank Organic Rinses  
Lab Sample #: 12442

Date Sampled: 12/11/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	12/31/2013	<0.10	mg	



951 Old Rand Road # 106  
Wauconda, IL 60084



## ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-12-4

BP-Whiting  
Whiting, IN  
Various

Lab Project #: 08-605  
Project Manager: Steve Flaherty  
Received: 12/16/2013  
Reported: 1/2/2014

Sample ID: FCU 600 Field Blank CPM Filters  
Lab Sample #: 12443

Date Sampled: 12/12/2013

Field #:

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
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Notes: UA - Not a NELAC accredited analyte under this method.

NA - Sample not tested for this analyte.

D - Value calculated from dilution.

J - Value less than the low standard but above the Limit of Detection (LOD).

L - Sample leaked before receipt.

H - Value greater than the high standard.

**USEPA METHOD 5 TASK SCHEDULE FORM**

Document Number: WL-DRYING-FORM-020A

Revision Number: 1

Effective Date: 10/30/10

**USEPA METHOD 5 TASK SCHEDULE**

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 12/11/13 – 12/12/13

Lab Project #: 08-605

Spreadsheet Template ID: USEPA-M201/202-Partic-Template-062T-REV3

Analyst: J. Ruggaber

DATE	TIME	EQUIPMENT	TASK
12/17/13	11:45	Desiccator # 2	Place labeled beakers in desiccator (store 24 hrs)
12/23/13	13:55	Oven #1	Heat filters in oven at 105 °C (min. 2 hours)
12/23/13	15:58	Desiccator #2	Place filters in desiccator (store min. 24 hours)
12/18/13	13:24	Balance #1	Weigh conditioned beakers and record tares
12/18/13 – 12/20/13	-	-	Dry down probe washes in tared beakers
12/20/13	9:00	Desiccator #2	Place beakers in desiccator (store min. 24 hours)
12/24/13	9:20	Balance #1	Beaker weighing #1
12/26/13	9:40	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
12/26/13	16:30	Balance #1	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
12/26/13	10:45	Balance #1	Filter weighing #1 (min. 24 hrs in desiccator)
12/27/13	8:59	Balance #1	Filter weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Filter weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Filter weighing #4 (min. 6 hrs after weighing #3)
1/2/14	-	-	Prepare report
			Report QA review
			Report distribution

LCS Sodium Chloride Solution: 1.003 g/L NaCl in DI water, WL-Log#5-Log-037A:30

**USEPA METHOD 201A TASK SCHEDULE**

Document Number: WL-M201ATASK-FORM-055A

Revision Number: 1

Effective Date: 04/01/13

**USEPA METHOD 201A TASK SCHEDULE**

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 12/11/13-12/12/13

Lab Project #: 08-605

Spreadsheet Template ID: USEPA-M201/202-Partic-Template-62T-REV3

Analyst: J. Ruggaber + E. Vogt

DATE	TIME	EQUIPMENT	TASK
12/17/13	11:45	Desiccator #1	Place labeled beakers in dessicator (store 24 hrs)
N/A	N/A	N/A	Heat filters in oven at 105 °C (approximately 2 hours)
N/A	N/A	N/A	Place filters in dessicator (store min. 24 hours)
12/18/13	13:24	Balance #1	Weigh conditioned beakers and record tares
12/18/13 – 12/20/13	-	-	Dry down probe washes and/or cyclone separator fractions and blanks in tared beakers in the hood.
12/18/13- 12/19/13	-	-	In a tared beaker, dry down 100 mL of the LCS solution in an oven at 110 °C.
12/20/13	9:00	Desiccator #1	Place beakers in dessicator (store min. 24 hours)
12/24/13	9:25	Balance #1	Beaker weighing #1
12/26/13	9:30	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
N/A	N/A	N/A	Filter weighing #1 (min. 24 hrs in dessicator)
N/A	N/A	N/A	Filter weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Filter weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Filter weighing #4 (min. 6 hrs after weighing #3)
1/2/14	-	-	Prepare report
			Report QA review
			Report distribution

LCS Sodium Chloride Solution:

USEPA METHOD 202 TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 12/11/13-12/12/13

Lab Project #: 08-605

Spreadsheet Template ID: USEPA-M201/202-Partic-Template-62T-REV3

Analyst: J. Ruggaber + E. Vogt

Reagent Information

Hexane Lot #13040459, Tedia Solvents

Phenolphthalein Solution (if needed): WL-Log#4-Log-037A:46

0.1 N Ammonium Hydroxide Lot # (if needed): 0.0992 N, Lot SHBC0698V, Fluka

Sodium Chloride Solution: 1.003 g/L NaCl, WL-Log#5-Log-037A:30

DATE	TIME	EQUIPMENT	TASK
12/17/13	11:45	Desiccator # 2	Label beakers for hexane rinse, imp samples, and LCS sample. Place beakers in desiccator (store 24 hrs).
12/18/13	13:24	Balance #1	Weigh conditioned beakers and record tares.
12/18/13	-	-	Sonicate filter in water for at least two minutes. Add the water to the imp contents. Repeat 2 more times.
12/18/13	-	-	Sonicate filter in hexane for at least two minutes. Add the hexane to the hexane sample contents. Repeat 2 more times.
12/18/13	-	-	Extract the imp contents with 30 mL of hexane 3 times. Collect all hexane extractions in the labeled and tared hexane beaker. Add the hexane sample to the hexane extractions.
12/18/13	-	-	Drain the water phase into the labeled and tared beaker.
12/18/13 12/20/13	-	-	Evaporate hexane beakers to dryness in a fume hood.
12/18/13	-	-	Transfer 100 mL of the sodium chloride solution into the tared LCS beaker.



# USEPA METHOD 202 TASK SCHEDULE FORM

Document Number: WL-202TASK-FORM-025B

Revision Number: 2

Effective Date: 01/20/11

12/18/13 - 12/23/13	-	Oven #1	Place the water phase beakers and LCS sample in an oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
12/20/13	9:10	Desiccator #2	Place hexane beakers in desiccator (store min. 24 hours)
		See next section	Place aqueous beakers in desiccator (store min. 24 hours)
12/24/13	9:38	Balance #1	Hexane beaker weighing #1
12/26/13	9:15	Balance #1	Hexane beaker weighing #2 (min. 6 hrs after weighing #1)
12/26/13	16:30	Balance #1	Hexane beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Hexane beaker weighing #4 (min. 6 hrs after weighing #3)
		See next section	Water Phase and LCS beaker weighing #1
N/A	N/A	N/A	Water Phase and LCS beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #4 (min. 6 hrs after weighing #3)
<b>If Water Phase Beakers achieve constant weight, skip this section</b>			
12/23/13	-	-	Redissolve the residue from water phases in 100 mL of DI water. Add approximately 5 drops of phenolphthalein.
12/23/13	-	-	Titrate with 0.1 N ammonium hydroxide. Record the amount of ammonium hydroxide used.
12/23/13	-	-	Return the water phase beakers to the oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
12/23/13	13:38	Desiccator #2	Place beakers in desiccator (store min. 24 hours)
12/26/13	10:15	Balance #1	Water Phase beaker weighing #1
12/26/13	16:30	Balance #1	Water Phase beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase beaker weighing #4 (min. 6 hrs after weighing #3)
<b>End Section</b>			
1/2/14	-	-	Prepare report
			Report QA review
			Report distribution



951 Old Rand Road, Unit 106  
Wauconda, Illinois 60084



1710 Preston Road, Unit C  
Pasadena, Texas 77503

## SAMPLE RECEIPT CHECKLIST

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 12/11 - 12/12/13

Chain-of-Custody Number(s): W02252 - W02254

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Preservation code noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Project information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Sample information clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Analysis request clearly identified	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Report tier level noted	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Sample Containers:

Quantity of samples match number on COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Container label ID numbers and descriptions match COC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All containers received in good condition	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Liquid levels at marked heights on containers	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All container labels are legible	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
All sample IDs are unique	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received in correct type of container	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received within the required holding time	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Samples received under the required preservation code	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met

Samples Received by: Eric Vogt Eric Vogt  
Printed Name Signature

Date and Time Received: 12/16/13 9:005



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W02252

Lab Project No. (Lab use only) 08-605	Client Name BP	Client Location Whiting IN	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request <sup>1</sup>	Preservation Code
ARI Proposal Number	ARI Test Plan Number	ARI Project Manager S. Flaherty					
ARI Sampler Initials JG KN, JB	Laboratory (Wauconda or Pasadena) Wauconda IL	Subcontracted Laboratory (if applicable)					
Engineering or Compliance Test Samples							
Label Number	Sample Date	Time of Collection <sup>2</sup>	Sample Identification	Number of Containers	Container Type	Preservation Code	Analysis Request <sup>1</sup>
55023	12-11-13		FCUG00 7PM Catch PM-1	1	Bottle	1	USEPA Method 201
55025			Probe Wash	1	"	1	USEPA Method 5
54319			Filter	1	Petri	1	
55026			Inorganic rinses	1	Bottle	1	
55027			Organic rinses	1	"	1	
55028			CPM Filter	1	"	1	
55029			7PM catch PM-2	1	"	1	
55030			Probe Wash	1	"	1	
55031			Filter	1	Petri	1	
55032			Inorganic rinses	1	Bottle	1	
55033			Organic rinses	1	"	1	
55034			CPM Filter	1	"	1	
55035	12-12-13		7PM Catch PM-3	1	"	1	
55036			Probe Wash	1	"	1	
55037			Filter	1	Petri	1	
Special Instructions:							
(1) Relinquished By: [Signature]							
(1) Date / Time: 12/13/13 1900							
(1) Company: ARI							
(1) Received By: [Signature]							
(1) Date / Time: 12/16/13 9:05							
(1) Company: ARI							
Date test results needed: Normal Turn							
Reporting level: Engineering Compliance							
Results results through: S. Flaherty							
Project manager signature: [Signature]							
SHIPMENT:				SHIPMENT:			
Hand Carry				Hand Carry			
FedEx				FedEx			
UPS				UPS			
Custody Seal Applied				Custody Seal Applied			
Yes				No			



# ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W02253

Lab Project No. (Lab use only) 08-605	Client Name BP	Client Location Whiting, IN	Number of Containers		Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request <sup>1</sup>		Preservation Code
ARI Proposal Number	ARI Test Plan Number	ARI Project Manager S. Flaherty	Sample Identification				USEPA Method 201A USEPA Method 5 USEPA Method 202		1 = Ambient Temp. 2 = 4°C (Ice Packs) 3 = Dry Ice 4 = Other (Noted)
ARI Sampler Initials JG.KN.T.B	Laboratory (Wauconda or Pasadena)	Subcontracted Laboratory (if applicable)	Time of Collection <sup>2</sup>						Comments
Engineering or Compliance Test Samples			Compliance						
Label Number	Sample Date	Time of Collection <sup>2</sup>	Sample Identification						
55036	12-12-13		Inorganic rinses PM-3		Bottle	1		X	
55037			Inorganic rinses		"	1		X	
55038			CPM Filter		"	1		X	
55039			PM10 catch		"	1		X	
55040			Probe wash		"	1		X	FLU 600
55041			Filter		"	1		X	Consent Date
55042			Inorganic rinses		Bottle	1		X	
55043			Inorganic rinses		"	1		X	
55044	12-11-13		CPM Filter		"	1		X	
55045			Acetone Blank		"	1		X	
55046			DIH2O Blank		"	1		X	
55047			Acetone Blank		"	1		X	
55048			Hexane Blank		"	1		X	
55049			Inorganic rinses Field Blank		"	1		X	
55050			Inorganic rinses Field Blank		"	1		X	
Special Instructions:			(1) Relinquished By R. [Signature]		(2) Relinquished By		(3) Relinquished By		SHIPMENT: Hand Carry FedEx UPS
Date test results needed:			(1) Date / Time 12/13/13 1900		(2) Date / Time		(3) Date / Time		Custody Seal Applied Yes No
Reporting level:			(1) Company [Signature]		(2) Company		(3) Company		
Route results through:			(1) Received By S. Flaherty		(2) Received By		(3) Received By		
Project manager signature:			(1) Date / Time 12/16/13 9:05		(2) Date / Time		(3) Date / Time		
			(1) Company A.R.T.		(2) Company		(3) Company		



Chain of Custody Record Number: W02254

[illegible]



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX D**

## **Calibration Data**

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Meter Console Information	
Console Model Number	MC522
Console Serial Number	6011012
DGM Model Number	MS4
DGM Serial Number	DGM 1510090

<sup>3</sup>The Critical Orifice Coefficient,  $K'$ , must be entered in English units,  $(\text{ft}^3/\text{sec})/\sqrt{(\text{in. Hg} \cdot \text{min})}$ .

Run Time		Calibration Data									
		Metering Console					Critical Office				
Elapsed ( $\Theta$ ) min	DGM Office $\Delta H$ ( $P_m$ ) in $H_2O$	Volume Initial ( $V_m$ ) cubic feet	Volume Final ( $V_m$ ) cubic feet	Outlet Temp Initial ( $T_{out}$ ) $^{\circ}F$	Outlet Temp Final ( $T_{out}$ ) $^{\circ}F$	Serial Number	Coefficient  see above 2	Amb Temp Initial ( $T_{amb}$ ) $^{\circ}F$	Amb Temp Final ( $T_{amb}$ ) $^{\circ}F$	Actual Vacuum  in Hg	
11.0	3.3	142.100	153.320	77	78	OX73	0.7780	76	76	14	
10.0	2.0	118.490	126.190	73	74	OX63	0.5905	75	75	15	
10.0	1.2	159.500	165.350	78	78	OX55	0.4455	76	77	17	
12.0	0.7	169.700	175.140	78	79	OX48	0.3451	77	78	18	
18.0	0.3	177.190	182.550	79	78	OX40	0.2303	78	78	20	

Results									
Standardized Data					Dry Gas Meter				
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate		AH @	
(V <sub>actual</sub> ) cubic feet	(Q <sub>actual</sub> ) cfm	(V <sub>correct</sub> ) cubic feet	(Q <sub>correct</sub> ) cfm	Value (Y)	Variation (ΔY)	Std & Corr (Q <sub>master</sub> ) cfm	Flowrate	0.75 SCFM (ΔH@) in H <sub>2</sub> O	Variation (ΔΔH@)
10.864	0.988	10.812	0.983	0.995	-0.004	0.983	1.877	1.877	-0.091
7.487	0.749	7.467	0.747	0.997	-0.002	0.747	1.973	1.973	0.005
5.630	0.563	5.626	0.563	0.999	0.000	0.563	2.060	2.060	0.092
5.223	0.435	5.225	0.435	1.000	0.001	0.435	1.942	1.942	-0.026
5.199	0.289	5.228	0.290	1.005	0.006	0.290	1.986	1.986	0.019
				1.000	Y Average				ΔH @ Average

CAL-MASTER-METER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

**Signature**

Date 12.11.12

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Pre -Test



Meter Box: 6011012  
 Calibrator: B. Crane  
 Date: 12/11/2012  
 Barometric: 29.25  
 Ambient Temp: 74

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			98	-0.36	98	-0.36
200			201	0.15	200	0.00
300			301	0.13	301	0.13
400			397	-0.35	397	-0.35
500			499	-0.10	498	-0.21

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	99	-0.18	98	-0.36	98	-0.36
200	202	0.30	200	0.00	200	0.00
300	302	0.26	301	0.13	301	0.13
400	399	-0.12	397	-0.35	397	-0.35
500	500	0.00	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	397	-0.35
600	600	0.00
800	802	0.16
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1400	0.00
1600	1602	0.10
1800	1800	0.00

Revised 10/03

**APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION  
USING CALIBRATED CRITICAL ORIFICES**

**3-POINT ENGLISH UNITS**

Meter Console Information	
Console Model Number	MC522
Console Serial Number	6011012
DGM Model Number	MS-4
DGM Serial Number	1510080.00

Calibration Conditions	
Date	16-Dec-13
Barometric Pressure	29.4 in Hg
Theoretical Critical Vacuum <sup>1</sup>	13.9 in Hg
Calibration Technician	B. Crane

Factors/Conversions	
Std Temp	528 °R
Std Press	29.92 in Hg
K <sub>1</sub>	17.647

<sup>1</sup>For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

<sup>2</sup>The Critical Orifice Coefficient, K<sub>1</sub> must be entered in English units, (ft<sup>3</sup>·°R<sup>1/2</sup>)/(in·Hg·min).

Calibration Data									
Metering Console					Critical Orifice				
Run Time	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp	Outlet Temp	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final
Elapsed (t)	(P <sub>in</sub> )	(V <sub>in</sub> )	(V <sub>out</sub> )	(t <sub>out</sub> )	(t <sub>in</sub> )		K <sup>1</sup>	(t <sub>amb</sub> )	(t <sub>amb</sub> )
min	in H <sub>2</sub> O	cubic feet	cubic feet	°F	°F		see above <sup>2</sup>	°F	°F
10.0	2.0	987.200	994.830	69	72	OX63	0.5894	73	73
12.0	2.0	994.830	1004.040	72	73	OX63	0.5894	73	73
10.0	2.0	1004.040	1011.740	73	73	OX63	0.5894	73	74
									19
									19
									19

Results									
Standardized Data					Dry Gas Meter				
Dry Gas Meter		Critical Orifice			Calibration Factor		Flowrate		
(V <sub>meas</sub> )	(Q <sub>meas</sub> )	(V <sub>corr</sub> )	(Q <sub>corr</sub> )	(Q <sub>std</sub> )	Value	Variation	Std & Corr	ΔH @	ΔH @
cubic feet	cfm	cubic feet	cfm	cfm	(Y)	(ΔY)	(Q <sub>meas</sub> corr)	(ΔH@)	(ΔH@)
7.507	0.751	7.513	0.751	0.751	1.001	0.002	0.751	1.972	0.005
9.027	0.752	9.016	0.751	0.751	0.999	0.000	0.751	1.965	-0.002
7.540	0.754	7.510	0.751	0.751	0.996	-0.003	0.751	1.965	-0.002
Pretest Gamma	1.000	% Deviation	0.1	0.999	Y Average			1.967	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature *B. Crane*

Date 12-16-13

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Post-Test



Meter Box: 6011012

Calibrator: B. Crane

Date: 12/16/2013

Barometric: 29.43

Ambient Temp: 74

Reference Thermometer: Altek Thermocouple Source

CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			97	-0.54	99	-0.18
200			200	0.00	201	0.15
300			299	-0.13	301	0.13
400			396	-0.47	398	-0.23
500			497	-0.31	498	-0.21

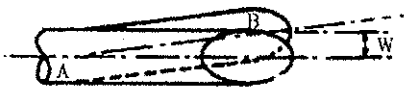
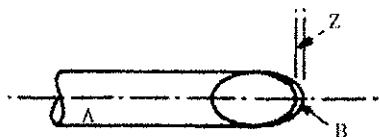
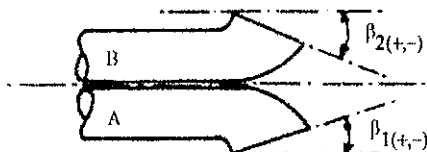
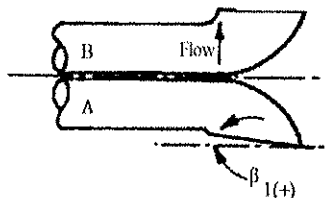
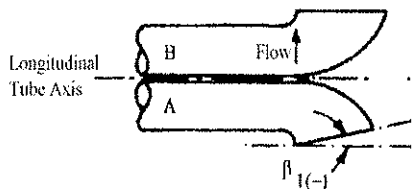
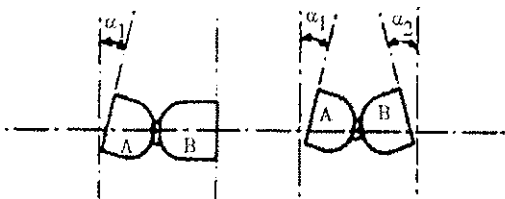
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	97	-0.54	97	-0.54
200	201	0.15	201	0.15	200	0.00
300	300	0.00	300	0.00	299	-0.13
400	397	-0.35	397	-0.35	396	-0.47
500	498	-0.21	497	-0.31	497	-0.31

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	396	-0.47
600	600	0.00
800	801	0.08
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1398	-0.11
1600	1600	0.00
1800	1798	-0.09

# Pitot Tube Inspection Data

Client Name: \_\_\_\_\_

Pre-Sample  
Date: 8/15/2013Post-Sample  
Date: 12/21/2013Transverse  
Tube Axis

Y	level?	Y
N	obstructions?	N
N	damaged?	N
0	$-10^\circ < \alpha_1 < +10^\circ$	0
1	$-10^\circ < \alpha_2 < +10^\circ$	0
0	$-5^\circ < \beta_1 < +5^\circ$	0
1	$-5^\circ < \beta_2 < +5^\circ$	2
1	$\gamma$	2
0	$\theta$	0
0.680	A	0.68
0.340	$0.2625 < P_A < 0.375$	0.340
0.340	$0.2625 < P_B < 0.375$	0.340
0.250	$0.1875 \leq D_t \leq 0.375$	0.250
0.012	$A \tan \gamma < 0.125''$	0.024
0.00000	$A \tan \theta < 0.03125''$	0.00000
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

**Comments:** 10' effective length M5 probe with s-type pitot tube, 1.4" tips, K-type thermocouple enclosed in a 1.5" OD sheath.

Pitot tube/probe number 354 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature:  
Date:

*[Signature]*  
12-21-13

D-5

**ARI Environmental Inc.**  
**Thermocouple Calibration Data Form**



**Calibrator:** B. Crane  
**Thermocouple ID.** 354  
**pretest**                      **posttest**  
**Date:** 8/15/2013              12/21/2013  
**Barometric:** 29.41              29.1  
**Reference Thermometer = Mercury in glass**

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
<b>Pre- Test</b>	T.C	Ice Water	32.1	32.0	0.02
		Ambient	74.2	74.5	-0.06
		Heat Source	296.8	297.1	-0.04
<b>Post- Test</b>	T.C	Ice Water	31.9	32.1	-0.04
		Ambient	64.7	65.1	-0.08
		Heat Source	290.8	292.4	-0.21

$$a \text{ (temp. diff.)} = (\text{ref. temp.} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$$

Where  $-1.5 < a < 1.5$



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX E**

## **Process Data**

---

MAIN BODY Process Data Summary Tables

Consent Decree

Run	PM10-1	PM10-2	PM10-3	PM10-4	Test Average
Total Feed Rate, BPD	56.8	56.9	57.0	57.0	56.9
FCCU Regenerator Coke Burn, lb/hr	31663	31851	34031	32685	32558
Ammonia Flow to ESP, lb/hr	80.0	80.1	80.0	80.3	80.1
ESP Total Primary Power, KW	140	140	139	139	140
ESP Total Secondary Current, Amps	4517	4507	4511	4515	4512
SO2, ppm @ 0%O2	10.3	7.8	1.7	1.3	6.6
NOx, ppm @ 0%O2	0.0	0.0	0.0	0.0	0
SO2 Additive Rate, PPD	337	700	700	700	579
Ammonia Slip (Calc), ppm	0.0	0.0	0.0	0.0	0.0
Regenerator Plenum Outlet Temperature, F	1365	1365	1351	1347	1360
Average ESP Inlet Temperature, F	886	886	885	886	886



BP Products North America, Inc.: Whiting, IN

FCCU 600

Test Dates: 12/11 & 12/12/13

## **APPENDIX F**

## **Test Program Qualifications**

---



## Test Program Qualifications

---

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

### **Steven Flaherty**

Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

### **Jeff Goldfine**

Mr. Goldfine is a Project Manager with ARI. His 11 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Goldfine is presently certified as a QSTI by the SES pursuant to the requirements of ASTM D7036-04.

### **W. Alex Hildreth**

Mr. Hildreth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Hildreth has 2 years of experience in conducting various source emission test programs. Mr. Hildreth is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

### **Jayce Best**

Mr. Best is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakanis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagweil, QSTI/QSTO Review Board

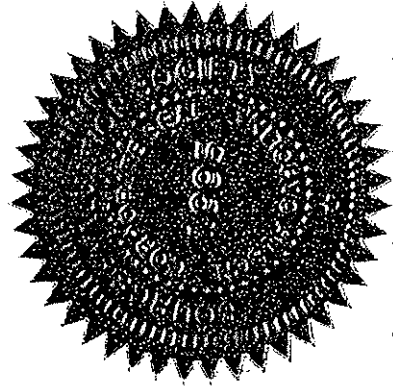
Karen D. Kallya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION

NO.

2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

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ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

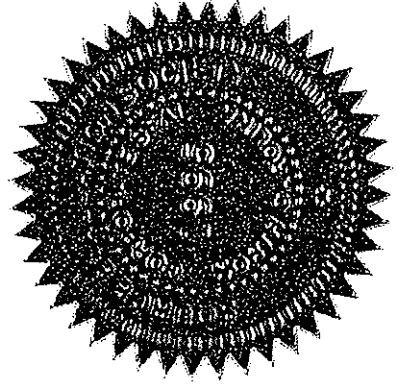
Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bengtson, QSTI/QSTO Review Board

Karen D. Kajiy-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board



APPLICATION

NO.

2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

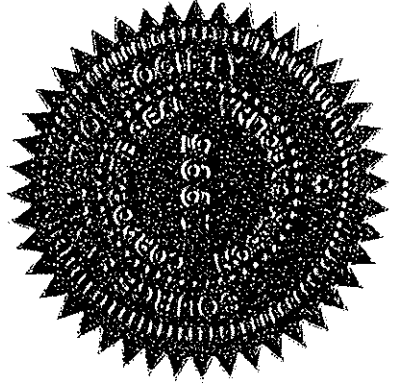
LET IT BE KNOWN THAT


**STEVEN M. FLAHERTY**


HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

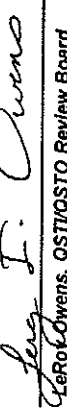
### **GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**


ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

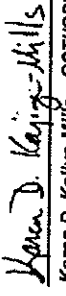


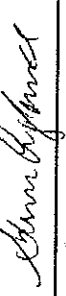
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

  
LeRoy Owens, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Karen D. Kallya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual


LET IT BE KNOWN THAT


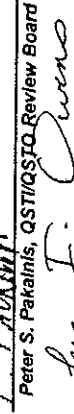
**STEVEN M. FLAHERTY**


HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

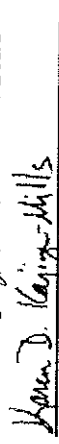
### **HAZARDOUS METALS MEASUREMENT SAMPLING METHODS**

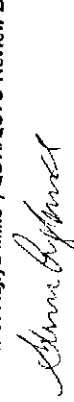
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Peter R. Westlin, QSTI/QSTO Review Board

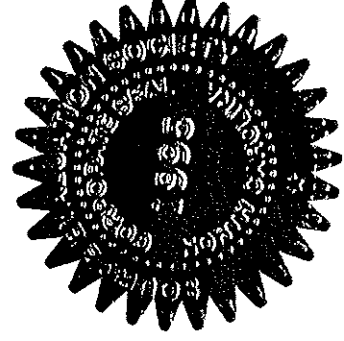
  
Peter S. Pakalnis, QSTI/QSTO Review Board  
  
LeRoy F. Owens, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Karen D. Kallja-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

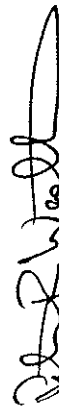
LET IT BE KNOWN THAT

**JEFF S. GOLDFINE**

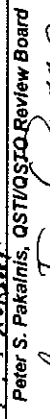
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS**

ISSUED THIS 16<sup>TH</sup> OF NOVEMBER 2010 AND EFFECTIVE UNTIL NOVEMBER 15<sup>TH</sup>, 2015

  
Peter R. Westlin, QST/QSTO Review Board

  
Peter S. Pakalnis, QST/QSTO Review Board

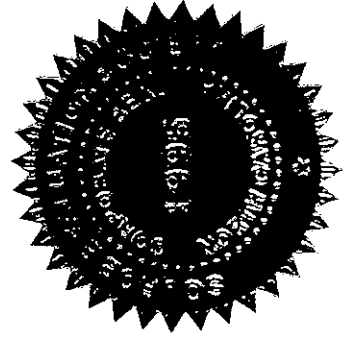
  
Leroy Owens, QST/QSTO Review Board

  
C. David Bagweff, QST/QSTO Review Board

  
Karen D. Kajiya-Mills, QST/QSTO Review Board

  
Glenn C. England, QST/QSTO Review Board

APPLICATION  
NO.  
2010-489



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

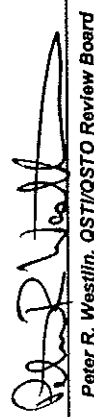
LET IT BE KNOWN THAT

**JEFF S. GOLDFINE**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR


### **MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**

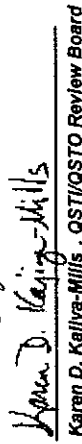
ISSUED THIS 16<sup>TH</sup> DAY OF NOVEMBER 2010 AND EFFECTIVE UNTIL NOVEMBER 15<sup>TH</sup>, 2015

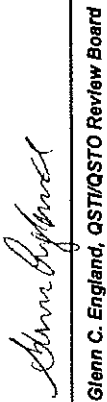
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakinakis, QSTI/QSTO Review Board

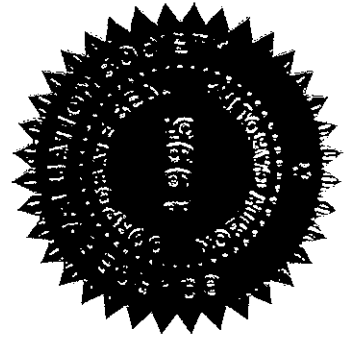
  
Greg F. Owens, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Karen D. Kelly-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2010-489



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

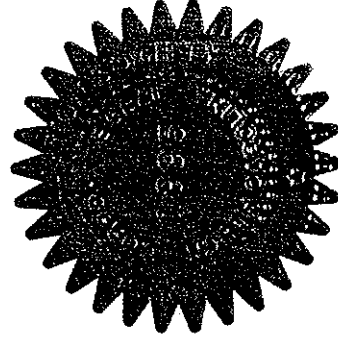
LET IT BE KNOWN THAT

**JEFF S. GOLDFINE**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **HAZARDOUS METALS MEASUREMENT SAMPLING METHODS**

ISSUED THIS 29<sup>TH</sup> DAY OF NOVEMBER 2011 AND EFFECTIVE UNTIL NOVEMBER 28<sup>TH</sup>, 2016



APPLICATION  
NO.  
2010-489

*C. David Bagweff*  
C. David Bagweff, QSTI/QSTO Review Board

*Karen D. Kajiya-Mills*  
Karen D. Kajiya-Mills, QSTI/QSTO Review Board

*Glenn C. England*  
Glenn C. England, QSTI/QSTO Review Board

*Peter R. Westlin*  
Peter R. Westlin, QSTI/QSTO Review Board

*Peter S. Pakianis*  
Peter S. Pakianis, QSTI/QSTO Review Board

*LeRoy Owens*  
LeRoy Owens, QSTI/QSTO Review Board

**Appendix 3c – FCU 500 Performance Testing  
December 2013**

# TEST REPORT

## NMOC COMPLIANCE EMISSION TEST FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.  
WHITING, INDIANA

PREPARED FOR:

***BP PRODUCTS NORTH AMERICA, INC.***

Whiting Refinery  
2918 Indianapolis Blvd.  
Whiting, Indiana 46394  
Phone: 219.473.3725  
E-mail: Brandon.Mik@bp.com  
Attention: Mr. Brandon Mik



ARI Environmental, Inc.  
951 Old Rand Road, Unit 106  
Wauconda, Illinois 60084  
Phone: 847.487.1580 Ext. 117  
Fax: 847.487.1587  
E-mail: sflaherty@arienv.com  
Steve Flaherty  
Senior Project Manager  
Source Testing Division

ARI Project No. 566-106  
ARI Proposal No. 12313  
BP Purchase Order No. 3000262112  
Test Date: December 12, 2013



## TABLE OF CONTENTS

<b>SECTIONS</b>	<b>PAGE</b>
REPORT CERTIFICATION	ii
Section 1 INTRODUCTION AND SUMMARY	1-1
Section 2 TESTING AND ANALYTICAL PROCEDURES	2-1
2.1 Overview	2-1
2.2 Methodology	2-1
2.2.1 Sampling Locations (USEPA Method 1)	2-1
2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)	2-1
2.2.3 Molecular Weight (USEPA Method 3)	2-1
2.2.4 Flue Gas Moisture Content (USEPA Method 4)	2-1
2.2.5 Non-Methane Organic Compounds (USEPA Methods 18 and 25A)	2-3
2.2.6 Gas Dilution System Verification (USEPA Method 205)	2-3
Section 3 PROCESS DESCRIPTION	3-1
Section 4 TEST RESULTS	4-1
<b>FIGURES</b>	
Figure 2-1 USEPA Method 4 Sampling Train (Moisture)	2-2
Figure 2-2 USEPA Method 25A Total Organic Compounds Sampling System	2-4
<b>TABLES</b>	
Table 1-1 Summary of FCCU 500 Stack NMOC Test Results	1-1
Table 4-1 FCCU 500 Stack NMOC Test Results	4-2
<b>APPENDICES</b>	
Appendix A Calculation Summaries	
Appendix B Field Data	
Appendix C ARI Reference Method Monitoring Data	
Appendix D Calibration Data	
Appendix E Process Data	
Appendix F Test Program Qualifications	



## REPORT CERTIFICATION

---

### STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

A handwritten signature in black ink, appearing to read 'Steve Flaherty', is written over a horizontal line.

Steve Flaherty, QSTI  
Senior Project Manager, Source Testing Division  
ARI Environmental, Inc.

A handwritten signature in black ink, appearing to read 'Hank Taylor', is written over a horizontal line.

Hank Taylor, QI  
Quality Assurance Manager, Source Testing Division  
ARI Environmental, Inc.



## SECTION ONE

## Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a non-methane organic compounds (NMOC) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on December 12, 2013.

Three 60-minute test runs were conducted on the FCCU 500 stack to determine the concentration and emission rate of NMOC. The emission test was performed to fulfill the testing requirements of BP's permit and consent decree.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4, 18 and 25A; 40 CFR 51, Appendix M, USEPA Method 205; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Brandon Mik of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Steve Flaherty and Brett O'Leary of ARI. The test was not witnessed by the Indiana Department of Environmental Management.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, ARI reference method monitoring data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

**TABLE 1-1. SUMMARY OF FCCU 500 STACK NMOC TEST RESULTS**

TEST RUN NO.	:	1	2	3	
TEST DATE	:	12/12/13	12/12/13	12/12/13	
TEST TIME	:	<u>10:45-11:45</u>	<u>12:10-13:10</u>	<u>13:45-14:45</u>	<u>Average</u>
<b>NMOC as Carbon (C<sub>1</sub>)</b>					
Concentration					
ppmv db		1.47	1.65	0.68	1.27
Emission Rate					
lb/hr		0.425	0.481	0.199	0.368
lb/1,000 barrels feed		0.155	0.176	0.073	0.135
Allowable Emission Rate					
lb/1,000 barrels feed					3.3



## SECTION TWO

## Testing and Analytical Procedures

---

### 2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana. Three 60-minute test runs were conducted on December 12, 2013 to determine the concentration and emission rate of NMOC.

### 2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4, 18 and 25A; 40 CFR 51, Appendix M, USEPA Method 205; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

#### 2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted at the FCCU 500 stack in the two (2) sampling ports provided in the 108-inch diameter stack. The sampling ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Sixteen (16) traverse points were used to sample the cross-sectional area of the stack. A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

#### 2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

#### 2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O<sub>2</sub> and CO<sub>2</sub> concentrations of each collected bag. The nitrogen (N<sub>2</sub>) content was calculated as the difference.

#### 2.2.4 Flue Gas Moisture Content (USEPA Method 4)

Stack gas moisture content was determined in accordance with USEPA Method 4 procedures. The stack gas was extracted at a constant rate through a series of chilled impingers. As shown in Figure 2-1, the first two impingers contained deionized/distilled water, the third impinger was initially empty and the fourth impinger contained silica gel for final water vapor removal. Total moisture collected was determined based upon the volumetric gains of impingers one through three and the weight gain of the silica gel contained in impinger four. One moisture sample was collected in conjunction with each 60-minute test run.

## SECTION TWO

## Testing and Analytical Procedures

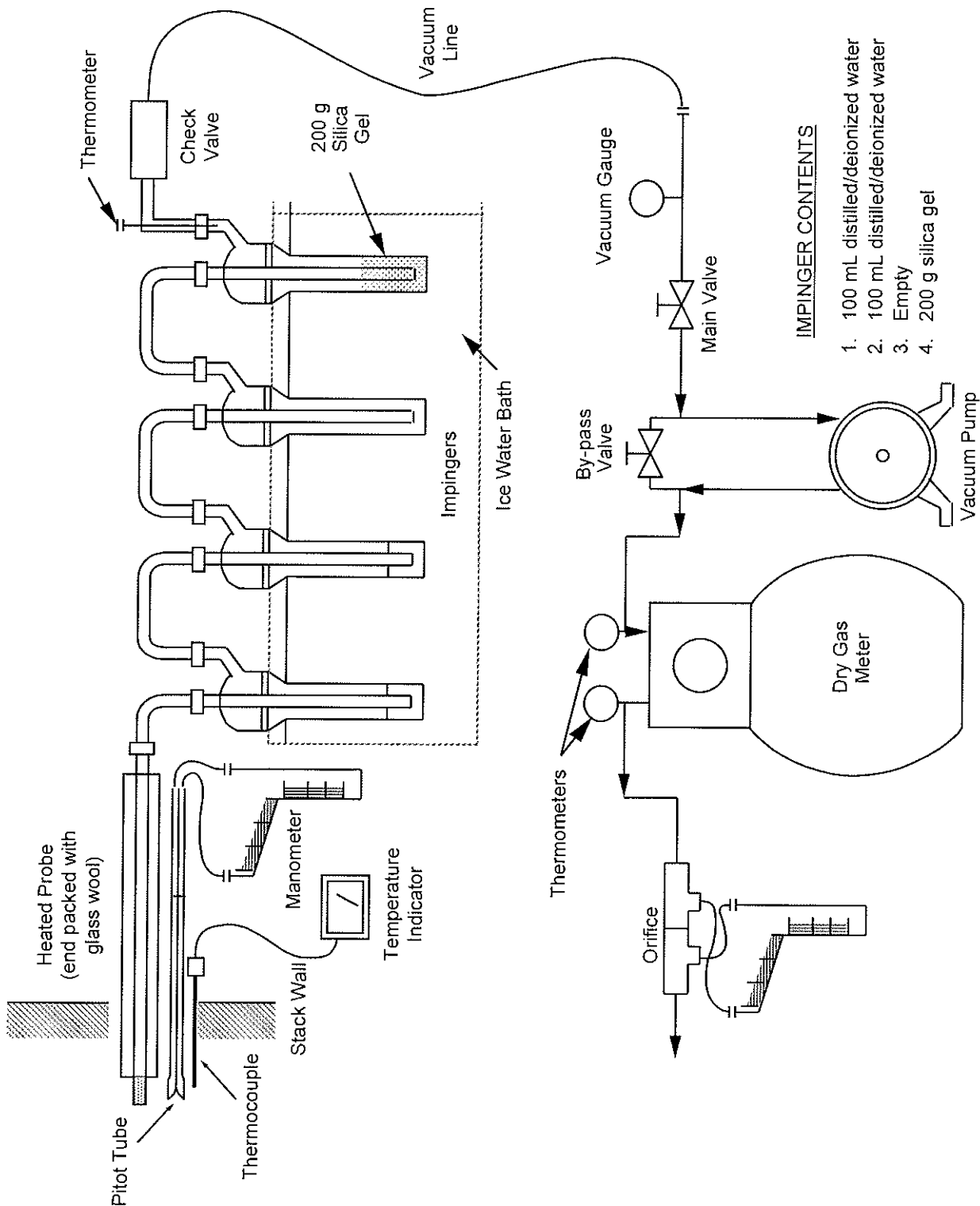


FIGURE 2-1. USEPA METHOD 4 SAMPLING TRAIN (MOISTURE)



## SECTION TWO

## Testing and Analytical Procedures

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### 2.2.5 Non-Methane Organic Compounds (USEPA Methods 18 and 25A)

The determination of total organic compounds and methane was conducted following procedures described in USEPA Method 25A using a VIG Model 200 total hydrocarbon analyzer. This analyzer splits the sample gas between two (2) channels; one is a continuously heated flame ionization detector (FID) for total organic compounds measurement, and the second is a gas chromatograph (GC) equipped with a FID and separation column that is specific to methane.

The sampling system consisted of a stainless steel probe with an in-stack filter holder connected to a three-way calibration tee. The sample gas was transported by a Teflon lined heated pump through a heated Teflon line ( $>250^{\circ}\text{F}$ ) to the intake of the hydrocarbon analyzer (see Figure 2-2).

Calibration gases for USEPA Method 25A were introduced at the three-way calibration tee located at the exit end of the sample probe. A pre-test calibration error and post-test calibration drift test were performed using a zero gas and methane in air standards of 25.0 ppm, 50.0 ppm and 84.0 ppm at an analyzer span of 100 ppm. The results of the initial system calibration error test were within the allowed  $\pm 5\%$  of the calibration gas concentrations. The zero and upscale calibration gas values obtained after each test run were within the allowable drift of  $\pm 3\%$  of span.

In addition, USEPA Method 18 procedures were conducted to determine the concentration of methane. Any methane detected was subtracted from the total organic compounds measured by the USEPA Method 25A procedures to yield the NMOC concentration as  $C_1$ . The GC/FID was calibrated using cylinder gas standards of methane in air to calculate a 3-point pre-test calibration curve using the same methane calibration gases described for USEPA Method 25A. A post-test calibration check was performed using the mid-level calibration gas to demonstrate that the post mid-level value had not deviated (drifted) by more than 5% from the pre-test value.

An Environics gas dilution system was used to prepare the calibration gases. The system was verified on site following USEPA Method 205 procedures.

Data were collected at 15-second intervals by ARI's data acquisition system. The data acquisition system consisted of an Omega OMB-DAQ-56 datalogger connected to a computer for digital data storage and reduction. DaqViewXL and Excel spreadsheet computer software were used for calculation of emission rates.

### 2.2.6 Gas Dilution System Verification (USEPA Method 205)

All diluted calibration standards were prepared using an Environics Model 4040 Gas Dilution System that was verified by a field evaluation at the job site prior to testing following the requirements of USEPA Method 205 (40 CFR 51, Appendix M).

## SECTION TWO

## Testing and Analytical Procedures

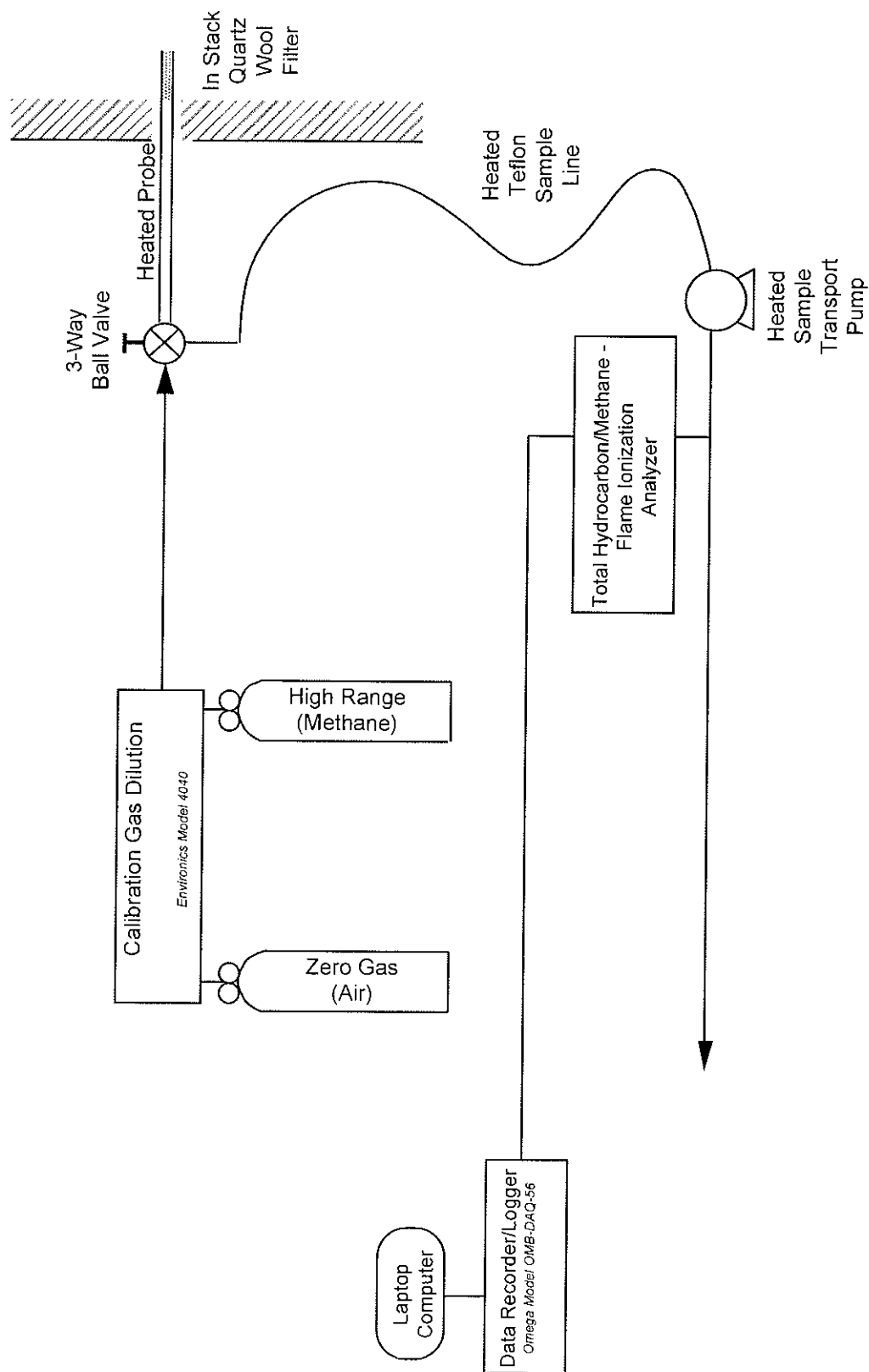


FIGURE 2-2. USEPA METHOD 25A TOTAL ORGANIC COMPOUNDS SAMPLING SYSTEM



## SECTION TWO

## Testing and Analytical Procedures

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ARI's Servomex Model 1440 paramagnetic O<sub>2</sub> analyzer was calibrated following USEPA Method 3A procedures. After the calibration procedure was complete, two diluted standards and a mid-range USEPA Protocol 1 standard were alternately introduced in triplicate, and an average instrument response was calculated for each standard. No single response differed by more than  $\pm 2\%$  from the average response for each standard. The difference between the instrument average and the predicted concentration was less than  $\pm 2\%$  for each diluted standard. The difference between the certified gas concentration and the average instrument response for the mid-range USEPA Protocol 1 standard was less than  $\pm 2\%$ .

Complete documentation of the USEPA Method 205 gas dilution system verification is presented in Appendix D.



## **SECTION THREE**

## **Process Description**

---

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.



## **SECTION FOUR**

## **Test Results**

---

The test results are presented in Table 4-1.

The calculation summaries, field data, ARI reference method monitoring data, calibration data, process data and test program qualifications are included in the appendices.

**SECTION FOUR****Test Results****TABLE 4-1. FCCU 500 STACK NMOC TEST RESULTS**

TEST RUN NO.	:	1	2	3	
TEST DATE	:	12/12/13	12/12/13	12/12/13	
TEST TIME	:	<u>10:45-11:45</u>	<u>12:10-13:10</u>	<u>13:45-14:45</u>	<u>Average</u>

**Process Data**

Feed rate, barrels per day	65,726	65,692	65,647	65,688
Feed rate, barrels per hour	2,739	2,737	2,735	2,737

**Stack Gas Parameters**

Temperature, °F	647.6	647.6	647.5	647.6
Velocity, av. ft/sec	108.9	108.6	108.9	108.8
Volumetric flow, acfm	415,513	414,591	415,562	415,222
Volumetric flow, scfm	195,159	194,717	195,179	195,018
Volumetric flow, dscfh	9,283,815	9,346,423	9,367,100	9,332,446
Moisture, av. % vol	20.72	20.00	20.01	20.24
Carbon Dioxide, av. % vol	16.9	16.5	16.6	16.7
Oxygen, av. % vol	2.4	2.5	2.4	2.4
Methane conc., ppmv wb	1.47	2.30	2.30	2.02

**Non-Methane Volatile Organic Compounds (as C<sub>1</sub>)**

Concentration				
ppmv db	1.47	1.65	0.68	1.27
x10 <sup>-6</sup> dscf	0.046	0.051	0.021	0.039
Emission rate				
lb/hr	0.425	0.481	0.199	0.368
lb/1,000 barrels feed	0.155	0.176	0.073	0.135
Allowable emission rate				
lb/1,000 barrels feed				3.3



BP Whiting Refinery: Whiting, IN  
FCCU 500  
Test Date: 12/12/13

## **APPENDIX A**

## **Calculation Summaries**

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# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 12/12/2013  
Run #: 1

## Data Input:

Volume metered ( $V_m$ ):	28.147 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.003 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg
Meter sample rate ( $\Delta H$ ):	0.80 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	51.7 °F
Volume of moisture collected ( $V_{ic}$ ):	160.4 milliliters
Stack Temperature ( $T_s$ ):	647.6 °F
Static Pressure ( $St$ ):	-1.9 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' Hg} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 28.896 \text{ dscf}$$

### Volume of water vapor in sample:

$$VW_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{ic} = 7.550 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{VW_{std}}{(Vm_{std} + VW_{std})} = 0.2072 B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 20.72 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 615.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{10^{\left( A \left( \frac{B}{(T_{s(K)} - C) \right) \right)}}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 1.0000$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

### Percent moisture used for emissions calculations:

$$= 20.72 \%$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 12/12/2013  
**Run #:** 1

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	16.9 %
Oxygen (O <sub>2</sub> ):	2.4 %
Nitrogen (N <sub>2</sub> ):	80.7 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2072 dimensionless
Stack Temperature (T <sub>s</sub> ):	647.6 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.3121 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>t</sub> ):	-1.93 inches H <sub>2</sub> O
Stack diameter:	108.00 inches
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.800 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 28.148 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_t}{13.6} \right) = 29.478 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 108.858 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 415,513 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 195,159 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 11,709,530 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) = 154,730 \text{ dscfm}$$

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) \times 60 = 9,283,815 \text{ dscfh}$$



**Reference Method Monitor Data**  
**One-Minute Averages**

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/2013  
Run #: 1  
Test Time: 10:45-11:45

		Clock Time	Elapsed Time	Stack Total VOC (as CH4) Monitor	Stack Methane Monitor
		Hr : min.	min	ppmv	ppmv
		10 : 45	0		
		10 : 46	1	2.9	1.9
		10 : 47	2	3.2	1.4
		10 : 48	3	3.5	1.2
		10 : 49	4	3.3	1.2
		10 : 50	5	3.1	1.2
		10 : 51	6	2.9	1.2
		10 : 52	7	2.8	1.1
		10 : 53	8	2.7	1.1
		10 : 54	9	2.6	1.1
		10 : 55	10	2.5	1.1
		10 : 56	11	2.4	1.1
		10 : 57	12	2.3	1.1
		10 : 58	13	2.3	1.1
		10 : 59	14	2.3	1.1
		11 : 00	15	2.2	1.1
		11 : 01	16	2.2	1.1
		11 : 02	17	2.3	1.1
		11 : 03	18	2.2	1.1
		11 : 04	19	2.2	1.2
		11 : 05	20	2.3	1.2
		11 : 06	21	3.1	1.2
		11 : 07	22	5.2	1.2
		11 : 08	23	5.9	1.3
		11 : 09	24	5.6	1.3
		11 : 10	25	4.7	1.3
		11 : 11	26	4.5	1.3
		11 : 12	27	4.0	1.4
		11 : 13	28	3.6	1.4
		11 : 14	29	3.4	1.4
		11 : 15	30	3.1	1.5
		11 : 16	31	3.0	1.5
		11 : 17	32	2.8	1.5
		11 : 18	33	2.8	1.5
		11 : 19	34	2.7	1.6
		11 : 20	35	2.5	1.6
		11 : 21	36	2.4	1.6
		11 : 22	37	2.4	1.6
		11 : 23	38	2.2	1.6
		11 : 24	39	2.2	1.6
		11 : 25	40	2.1	1.6
		11 : 26	41	2.1	1.6
		11 : 27	42	2.4	1.7
		11 : 28	43	2.2	1.7
		11 : 29	44	2.2	1.7
		11 : 30	45	2.1	1.7
		11 : 31	46	2.1	1.8
		11 : 32	47	2.0	1.8
		11 : 33	48	2.0	1.8
		11 : 34	49	1.9	1.8
		11 : 35	50	1.9	1.8
		11 : 36	51	1.8	1.8
		11 : 37	52	1.7	1.8
		11 : 38	53	1.6	1.8
		11 : 39	54	1.6	1.8
		11 : 40	55	1.7	1.7
		11 : 41	56	1.7	1.7
		11 : 42	57	1.7	1.7
		11 : 43	58	1.6	1.8
		11 : 44	59	1.4	1.8
		11 : 45	60	1.5	1.8
		AVERAGE:		2.6	1.5

Stack Total VOC (as CH4)	
Analyzer Type:	Stack Total VOC (as CH4)
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	50.19 ppmv
Post-test calibration span value:	49.61 ppmv
Pre-test calibration zero value:	0.05 ppmv
Post-test calibration zero value:	0.07 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	2.63 ppmv

Stack Methane	
Analyzer Type:	Stack Methane (as CH4)
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	50.30 ppmv
Post-test calibration span value:	50.51 ppmv
Pre-test calibration zero value:	0.47 ppmv
Post-test calibration zero value:	0.56 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	1.47 ppmv



**USEPA Method 25-A**  
**Non-Methane Volatile Organics (as carbon)**  
**Calibration Drift Correction And Emission Rate Calculation**

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/2013  
Test Run #: 1  
Test Run Time: 10:45-11:45

**Data Input:**

Average chart reading (C):	2.63 ppmv
Average pre/post-test zero calibration reading (C <sub>o</sub> ):	0.06 ppmv
Calibration gas concentration (C <sub>ma</sub> ):	50.00 ppmv
Average pre/post-test calibration gas reading (C <sub>m</sub> ):	49.90 ppmv
Stack gas volumetric flow rate (Q <sub>std</sub> ):	9,283,815 dscfh
Compound molecular weight (MW):	12.01 lb/lb-mole
Stack gas fractional moisture content (B <sub>wo</sub> ):	0.2072 fractional
Methane concentration:	1.47 ppmv wb
Process Feed Rate:	2,739 barrels/hour

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Non-Methane Volatile Organics (as carbon)**

**Uncorrected for zero and calibration drift:**

$$C_{\text{gas, ppm wet basis -- methane}} = 1.2 \text{ ppmv wb}$$

**Non-Methane Volatile Organics (as carbon)**

**Corrected to Dry Basis:**

$$C_{\text{gas, ppm dry basis}} = \frac{(C_{\text{gas, ppm wet basis}})}{(1 - B_{\text{wo}})} = 1.5 \text{ ppmv db}$$

**Non-Methane Volatile Organics (as carbon)**

**Concentration:**

$$C_{\text{gas, lb / dscf}} = C_{\text{gas, ppm}} \times \left( \frac{\text{MW lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right) = 0.046 \times 10^{-6} \text{ lbs/dscf}$$

**Non-Methane Volatile Organics (as carbon)**

**Emission Rate:**

$$E_{\text{gas, lb / hr}} = (C_{\text{gas, lb / dscf}}) \times (Q_{\text{std}}) = 0.425 \text{ lbs/hr}$$

$$E_{\text{gas, lb / 1000 bbl feed}} = \frac{(E_{\text{gas, lb / hr}}) \times 1000}{\text{FeedRate bbl / hour}} = 0.155 \text{ lb/1000bbl feed}$$



# USEPA Method 4 Moisture Determination Sample Calculations

Client: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Date: 12/12/2013  
Run #: 2

## Data Input:

Volume metered (V <sub>m</sub> ):	28.138 ft <sup>3</sup>
Meter calibration coefficient (Y <sub>d</sub> ):	1.003 dimensionless
Barometric pressure (P <sub>bar</sub> ):	29.62 inches Hg
Meter sample rate (ΔH):	0.80 inches H <sub>2</sub> O
Meter inlet/outlet temperature (T <sub>m</sub> ):	67.3 °F
Volume of moisture collected (V <sub>ic</sub> ):	148.9 milliliters
Stack Temperature (T <sub>s</sub> ):	647.6 °F
Static Pressure (St):	-1.9 inches H <sub>2</sub> O

## Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

### Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' Hg} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 28.035 \text{ dscf}$$

### Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{ic} = 7.009 \text{ scf}$$

### Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = 0.2000 \text{ } B_{wo}$$

### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 20.00 \%$$

### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 615.0 \text{ } ^\circ \text{Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{S_t}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{ws} = \frac{\sqrt[10]{\left( 10^{\left( A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)} \right)}}{P_{s(\text{mmHg})}} \quad \begin{array}{l} \text{where:} \\ A = 8.361 \\ B = 1893.5 \\ C = 27.65 \end{array} = 1.0000 \%$$

### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{ws} \times 100 = 100.00$$

### Percent moisture used for emissions calculations:

$$= 20.00 \%$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 12/12/2013  
**Run #:** 2

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	16.5 %
Oxygen (O <sub>2</sub> ):	2.5 %
Nitrogen (N <sub>2</sub> ):	81.0 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2000 dimensionless
Stack Temperature (T <sub>s</sub> ):	647.6 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.3101 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>i</sub> ):	-1.93 inches H <sub>2</sub> O
Stack diameter:	108.00 inches
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.740 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 28.192 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.478 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 108.616 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 414,591 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 194,717 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 11,683,049 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) = 155,774 \text{ dscfm}$$

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) \times 60 = 9,346,423 \text{ dscfh}$$



**Reference Method Monitor Data**  
**One-Minute Averages**

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/2013  
Run #: 2  
Test Time: 12:10-13:10

Clock Time Hr : min.	Elapsed Time min	Stack Total VOC (as CH4) Monitor	Stack Methane Monitor
		ppmv	ppmv
12 : 10	0		
12 : 11	1	3.2	2.3
12 : 12	2	3.3	2.2
12 : 13	3	3.3	2.2
12 : 14	4	3.4	2.2
12 : 15	5	3.3	2.2
12 : 16	6	3.2	2.3
12 : 17	7	3.2	2.3
12 : 18	8	3.2	2.3
12 : 19	9	3.3	2.3
12 : 20	10	3.3	2.3
12 : 21	11	3.2	2.3
12 : 22	12	3.2	2.3
12 : 23	13	3.1	2.3
12 : 24	14	3.0	2.3
12 : 25	15	2.9	2.3
12 : 26	16	2.9	2.3
12 : 27	17	2.9	2.3
12 : 28	18	2.9	2.3
12 : 29	19	2.8	2.3
12 : 30	20	3.1	2.3
12 : 31	21	7.9	2.2
12 : 32	22	6.2	2.2
12 : 33	23	5.1	2.2
12 : 34	24	4.7	2.2
12 : 35	25	4.4	2.3
12 : 36	26	4.0	2.4
12 : 37	27	3.9	2.4
12 : 38	28	3.8	2.4
12 : 39	29	3.7	2.4
12 : 40	30	3.6	2.4
12 : 41	31	3.7	2.4
12 : 42	32	4.1	2.4
12 : 43	33	5.1	2.4
12 : 44	34	4.3	2.4
12 : 45	35	3.9	2.4
12 : 46	36	3.6	2.4
12 : 47	37	3.6	2.4
12 : 48	38	3.8	2.4
12 : 49	39	3.8	2.4
12 : 50	40	3.8	2.4
12 : 51	41	3.7	2.4
12 : 52	42	3.6	2.4
12 : 53	43	3.4	2.4
12 : 54	44	3.3	2.4
12 : 55	45	3.2	2.3
12 : 56	46	3.5	2.3
12 : 57	47	3.7	2.3
12 : 58	48	3.4	2.3
12 : 59	49	3.4	2.2
13 : 00	50	3.2	2.2
13 : 01	51	3.1	2.2
13 : 02	52	3.5	2.2
13 : 03	53	3.3	2.2
13 : 04	54	3.2	2.2
13 : 05	55	3.2	2.2
13 : 06	56	3.6	2.2
13 : 07	57	3.3	2.1
13 : 08	58	3.1	2.1
13 : 09	59	3.4	2.1
13 : 10	60	3.5	2.1
AVERAGE:		3.6	2.3

Stack Total VOC (as CH4)	
<b>Analyzer Type:</b>	<b>Stack Total VOC (as CH4)</b>
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	49.61 ppmv
Post-test calibration span value:	49.94 ppmv
Pre-test calibration zero value:	0.07 ppmv
Post-test calibration zero value:	0.31 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	3.62 ppmv

Stack Methane	
<b>Analyzer Type:</b>	<b>Stack Methane (as CH4)</b>
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	50.30 ppmv
Post-test calibration span value:	50.51 ppmv
Pre-test calibration zero value:	0.47 ppmv
Post-test calibration zero value:	0.56 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	2.30 ppmv



# USEPA Method 25-A Non-Methane Volatile Organics (as carbon) Calibration Drift Correction And Emission Rate Calculation

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/13  
Test Run #: 2  
Test Run Time: 12:10-13:10

## Data Input:

Average chart reading (C):	3.62 ppmv
Average pre/post-test zero calibration reading (C <sub>o</sub> ):	0.19 ppmv
Calibration gas concentration (C <sub>ma</sub> ):	50.00 ppmv
Average pre/post-test calibration gas reading (C <sub>m</sub> ):	49.77 ppmv
Stack gas volumetric flow rate (Q <sub>std</sub> ):	9,346,423 dscfh
Compound molecular weight (MW):	12.01 lb/lb-mole
Stack gas fractional moisture content (B <sub>wo</sub> ):	0.2000 fractional
Methane concentration:	2.30 ppmv wb
Process Feed Rate:	2,737 barrels/hour

*Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):*

**Non-Methane Volatile Organics (as carbon)**

*Uncorrected for zero and calibration drift:*

$$C_{\text{gas, ppm wet basis}} - \text{methane} = 1.3 \text{ ppmv wb}$$

**Non-Methane Volatile Organics (as carbon)**

*Corrected to Dry Basis:*

$$C_{\text{gas, ppm dry basis}} = \frac{(C_{\text{gas, ppm wet basis}})}{(1 - B_{\text{wo}})} = 1.6 \text{ ppmv db}$$

**Non-Methane Volatile Organics (as carbon)**

*Concentration:*

$$C_{\text{gas, lb / dscf}} = C_{\text{gas, ppm}} \times \left( \frac{\text{MW lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right) = 0.051 \times 10^{-6} \text{ lbs/dscf}$$

**Non-Methane Volatile Organics (as carbon)**

*Emission Rate:*

$$E_{\text{gas, lb / hr}} = (C_{\text{gas, lb / dscf}}) \times (Q_{\text{std}}) = 0.481 \text{ lbs/hr}$$

$$E_{\text{gas, lb / 1000bbl feed}} = \frac{(E_{\text{gas, lb / hr}}) \times 1000}{\text{FeedRate bbl / hour}} = 0.176 \text{ lb/1000bbl feed}$$



## USEPA Method 4 Moisture Determination Sample Calculations

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 12/12/2013  
**Run #:** 3

### Data Input:

Volume metered ( $V_m$ ):	28.431 ft <sup>3</sup>
Meter calibration coefficient ( $Y_d$ ):	1.003 dimensionless
Barometric pressure ( $P_{bar}$ ):	29.62 inches Hg
Meter sample rate ( $\Delta H$ ):	0.80 inches H <sub>2</sub> O
Meter inlet/outlet temperature ( $T_m$ ):	72.1 °F
Volume of moisture collected ( $V_{lc}$ ):	149.2 milliliters
Stack Temperature ( $T_s$ ):	647.5 °F
Static Pressure ( $St$ ):	-2.0 inches H <sub>2</sub> O

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Volume of sample, dry basis:

$$V_{m_{std}} = V_m \times Y_d \times \left( \frac{528.0^\circ R}{29.92'' \text{ Hg}} \right) \times \left( \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460} \right) = 28.069 \text{ dscf}$$

#### Volume of water vapor in sample:

$$V_{w_{std}} = \frac{0.04707 \text{ ft}^3}{\text{ml}} \times V_{lc} = 7.023 \text{ scf}$$

#### Fractional moisture content of stack gas:

$$B_{wo} = \frac{V_{w_{std}}}{(V_{m_{std}} + V_{w_{std}})} = 0.2001 B_{wo}$$

#### Percent Moisture:

$$\% \text{moisture} = B_{wo} \times 100 = 20.01 \%$$

#### Fractional moisture content of stack gas at saturated conditions:

$$T_{s(K)} = ((T_s - 32) \times 0.5556) + 273 = 615.0 \text{ °Kelvin}$$

$$P_{s(\text{mmHg})} = \left( P_{bar} + \frac{St}{13.6} \right) \times 25.401 = 752.38 \text{ mm Hg}$$

$$B_{wos} = \frac{\sqrt[10]{\left( A \left( \frac{B}{(T_{s(K)} - C)} \right) \right)}}{P_{s(\text{mmHg})}}$$

where:

A= 8.361

B=1893.5

C=27.65

$$= 1.0000$$

#### Percent moisture at saturated conditions:

$$\% \text{moisture}_{\text{saturated}} = B_{wos} \times 100 = 100.00 \%$$

#### Percent moisture used for emissions calculations:

$$= 20.01 \%$$



## USEPA Method 2 Volumetric Flow Rate Sample Calculations (Circular Ducts)

**Client:** BP  
**Location:** Whiting, IN  
**Source:** FCCU 500 Exhaust  
**Date:** 12/12/2013  
**Run #:** 3

### Data Input

Carbon Dioxide (CO <sub>2</sub> ):	16.6 %
Oxygen (O <sub>2</sub> ):	2.4 %
Nitrogen (N <sub>2</sub> ):	81.0 %
Fractional Moisture Content (B <sub>wo</sub> ):	0.2001 dimensionless
Stack Temperature (T <sub>s</sub> ):	647.5 °F
Pitot Coefficient (C <sub>p</sub> ):	0.84 dimensionless
Average square root of ΔP	1.3134 inches H <sub>2</sub> O
Barometric Pressure (P <sub>bar</sub> ):	29.62 inches Hg
Static Pressure (S <sub>i</sub> ):	-1.95 inches H <sub>2</sub> O
Stack diameter:	108.00 inches
Stack area (A <sub>s</sub> ):	63.6172 ft <sup>2</sup>

### Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

#### Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2) = 30.752 \text{ lb/lb-mole}$$

#### Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws}) = 28.200 \text{ lb/lb-mole}$$

#### Absolute stack gas pressure:

$$P_s = P_{bar} + \left( \frac{S_i}{13.6} \right) = 29.477 \text{ inches H}_2\text{O}$$

#### Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}} = 108.870 \text{ feet/second}$$

#### Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60 = 415,562 \text{ acfm}$$

#### Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] = 195,179 \text{ scfm}$$

$$Q_{sw} = Q_a \times \left[ \left( \frac{528^\circ R}{29.92 \text{ in. Hg}} \right) \times \left( \frac{P_s}{T_s + 460} \right) \right] \times 60 = 11,710,720 \text{ scfh}$$

#### Stack gas volumetric flow rate, dry basis:

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) = 156,118 \text{ dscfm}$$

$$Q_{sd} = Q_{sw} \times (1 - B_{wo}) \times 60 = 9,367,100 \text{ dscfh}$$



**Reference Method Monitor Data**  
**One-Minute Averages**

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/2013  
Run #: 3  
Test Time: 13:45-14:45

		Clock Time	Elapsed Time	Stack Total VOC (as CH4) Monitor	Stack Methane Monitor
		Hr : min.	min	ppmv	ppmv
		13 : 45	0		
		13 : 46	1	2.6	2.2
		13 : 47	2	2.8	1.9
		13 : 48	3	2.9	1.8
		13 : 49	4	3.1	1.8
		13 : 50	5	3.2	1.8
		13 : 51	6	3.2	1.9
		13 : 52	7	3.2	2.0
		13 : 53	8	3.3	2.0
		13 : 54	9	3.3	2.0
		13 : 55	10	3.1	2.2
		13 : 56	11	3.2	2.2
		13 : 57	12	3.1	2.2
		13 : 58	13	3.2	2.2
		13 : 59	14	3.2	2.1
		14 : 00	15	3.3	2.1
		14 : 01	16	3.3	2.1
		14 : 02	17	4.4	2.1
		14 : 03	18	3.9	2.3
		14 : 04	19	3.5	2.4
		14 : 05	20	3.5	2.4
		14 : 06	21	3.4	2.4
		14 : 07	22	3.3	2.5
		14 : 08	23	4.0	2.5
		14 : 09	24	3.5	2.5
		14 : 10	25	3.3	2.5
		14 : 11	26	3.3	2.4
		14 : 12	27	3.3	2.3
		14 : 13	28	3.5	2.3
		14 : 14	29	3.3	2.3
		14 : 15	30	3.2	2.4
		14 : 16	31	3.1	2.4
		14 : 17	32	3.5	2.4
		14 : 18	33	3.2	2.4
		14 : 19	34	3.0	2.7
		14 : 20	35	3.1	2.8
		14 : 21	36	3.0	2.8
		14 : 22	37	2.9	2.8
		14 : 23	38	2.9	2.6
		14 : 24	39	3.0	2.5
		14 : 25	40	2.9	2.5
		14 : 26	41	2.9	2.5
		14 : 27	42	2.9	2.6
		14 : 28	43	2.9	2.7
		14 : 29	44	2.9	2.7
		14 : 30	45	0.2	2.7
		14 : 31	46	0.5	2.7
		14 : 32	47	0.5	2.7
		14 : 33	48	0.4	2.7
		14 : 34	49	1.4	2.7
		14 : 35	50	1.2	2.4
		14 : 36	51	1.7	2.0
		14 : 37	52	1.4	2.0
		14 : 38	53	1.7	2.0
		14 : 39	54	3.1	2.0
		14 : 40	55	3.1	2.0
		14 : 41	56	2.7	2.0
		14 : 42	57	2.5	2.0
		14 : 43	58	3.0	2.0
		14 : 44	59	3.3	2.0
		14 : 45	60	2.7	2.0
		AVERAGE:		2.8	2.3

**Stack Total VOC (as CH4)**

<b>Analyzer Type:</b>	<b>Stack Total VOC (as CH4)</b>
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	49.94 ppmv
Post-test calibration span value:	48.20 ppmv
Pre-test calibration zero value:	0.31 ppmv
Post-test calibration zero value:	0.30 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	2.85 ppmv

**Stack Methane**

<b>Analyzer Type:</b>	<b>Stack Methane (as CH4)</b>
Analyzer Scale:	100.00 ppmv
Pre-test calibration span value:	50.30 ppmv
Post-test calibration span value:	50.51 ppmv
Pre-test calibration zero value:	0.47 ppmv
Post-test calibration zero value:	0.56 ppmv
Calibration gas type:	Protocol 1 Methane/Air Balance ppmv
Calibration gas concentration:	50.00 ppmv
Monitor uncorrected average:	2.30 ppmv



**USEPA Method 25-A**  
**Non-Methane Volatile Organics (as carbon)**  
**Calibration Drift Correction And Emission Rate Calculation**

Company: BP  
Location: Whiting, IN  
Source: FCCU 500 Exhaust  
Test Date: 12/12/13  
Test Run #: 3  
Test Run Time: 13:45-14:45

**Data Input:**

Average chart reading (C):	2.85 ppmv
Average pre/post-test zero calibration reading (C <sub>o</sub> ):	0.30 ppmv
Calibration gas concentration (C <sub>ma</sub> ):	50.00 ppmv
Average pre/post-test calibration gas reading (C <sub>m</sub> ):	49.07 ppmv
Stack gas volumetric flow rate (Q <sub>std</sub> ):	9,367,100 dscfh
Compound molecular weight (MW):	12.01 lb/lb-mole
Stack gas fractional moisture content (B <sub>wo</sub> ):	0.2001 fractional
Methane concentration:	2.30 ppmv wb
Process Feed Rate:	2,735 barrels/hour

**Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):**

**Non-Methane Volatile Organics (as carbon)**

**Uncorrected for zero and calibration drift:**

$$C_{\text{gas, ppm wet basis}} - \text{methane} = 0.5 \text{ ppmv wb}$$

**Non-Methane Volatile Organics (as carbon)**

**Corrected to Dry Basis:**

$$C_{\text{gas, ppm dry basis}} = \frac{(C_{\text{gas, ppm wet basis}})}{(1 - B_{\text{wo}})} = 0.7 \text{ ppmv db}$$

**Non-Methane Volatile Organics (as carbon)**

**Concentration:**

$$C_{\text{gas, lb / dscf}} = C_{\text{gas, ppm}} \times \left( \frac{\text{MW lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right) = 0.021 \times 10^{-6} \text{ lbs/dscf}$$

**Non-Methane Volatile Organics (as carbon)**

**Emission Rate:**

$$E_{\text{gas, lb / hr}} = (C_{\text{gas, lb / dscf}}) \times (Q_{\text{std}}) = 0.199 \text{ lbs/hr}$$

$$E_{\text{gas, lb / 1000bbl feed}} = \frac{(E_{\text{gas, lb / hr}}) \times 1000}{\text{FeedRate bbl / hour}} = 0.073 \text{ lb/1000bbl feed}$$



BP Whiting Refinery: Whiting, IN  
FCCU 500  
Test Date: 12/12/13

## **APPENDIX B**

## **Field Data**

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# FIELD DATA

PLANT **BP**  
DATE **12-13-13**  
LOCATION **224 Hwy, IN**  
OPERATOR **BC**  
STACK NO. **FCU 500**  
RUN NO. **1**  
SAMPLE BOX NO. **N/A**  
METER BOX NO. **0811003**  
START TIME **1045**

AMBIENT TEMPERATURE **37°**  
BAROMETRIC PRESSURE **29.62**  
ASSUMED MOISTURE, % **20**  
PROBE LENGTH, in. **108**  
NOZZLE DIAMETER, in. **60**  
STACK DIAMETER, in. **1**  
MINUTES PER POINT **1**  
NUMBER OF PORTS **1**

PROBE HEATER SETTING **N/A**  
HEATER BOX SETTING **N/A**  
METER Hg **N/A**  
C<sub>p</sub> FACTOR **0.34**  
Y<sub>4</sub> FACTOR **1.003**  
PITOT NO.

WEIGHT OF PARTICULATE, mg			
Filter No.			
Sample			
Final wt			
Tare wt			
Wt gain			
TOTAL			

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>s</sub> ) °F	VELOCITY HEAD		GAS SAMPLE VOLUME (Nm <sup>3</sup> )	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔP) in. H <sub>2</sub> O		GAS SAMPLE DRY GAS METER INLET (T <sub>inlet</sub> ) °F	GAS SAMPLE OUTLET (T <sub>outlet</sub> ) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
					(ΔP <sub>s</sub> )	(ΔP <sub>g</sub> )		ACTUAL	DESIRED							
1045		0	-1.95		SEE VELOCITY TRAVERSE		0.000	0.80								
1050		5					2.45	0.80								
1055		10					5.20									
1100		15					7.51									
1105		20					9.74									
1110		25					12.01									
1115		30					14.31									
1120		35					16.60									
1125		40					18.92									
1130		45					21.30									
1135		50					23.51									
1140		55					25.82									
1145		60					28.177									
AVERAGE		60 mins	-1.95				25.177	0.800								


VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL	224	118	0			218.7
INITIAL	100	100	0	56		280
LIQUID COLLECTED	124	18				13.7
TOTAL LIQUID COLLECTED (Specify ml or g)						160.4

ORSAT DATA		TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1				
TRIAL 2			16.9	2.4
TRIAL 3			16.9	2.4
Average			16.9	2.4

LEAK CHECK	
SYSTEM PRE: 0.000	CFM@15" Hg
POST: 0.000	CFM@15" Hg
PITOT PRE: 5.1	@ > 3" H <sub>2</sub> O
POST: 5.1	@ > 3" H <sub>2</sub> O

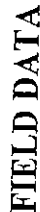


## FIELD DATA

PLANT	BP White	AMBIENT TEMPERATURE	35°	PROBE HEATER SETTING	N/A	WEIGHT OF PARTICULATE, mg		CROSS SECTION
DATE	12-12-13	BAROMETRIC PRESSURE	29.62	HEATER BOX SETTING	N/A			
LOCATION	FCU 500	ASSUMED MOISTURE, %	20	METER H <sub>2</sub> O	N/A			
OPERATOR	BO	PROBE LENGTH, in.		C <sub>p</sub> FACTOR	0.59			
STACK NO.	FCU 500	NOZZLE DIAMETER, in.		Y <sub>d</sub> FACTOR	1.003			
RUN NO.	2	STACK DIAMETER, in.	108	PITOT NO.				
SAMPLE BOX NO.	N/A	MINUTES PER POINT	60				TOTAL	mg
METER BOX NO.	081003	NUMBER OF POINTS	1					
START TIME	1216	NUMBER OF PORTS						

[illegible]

LIQUID COLLECTED		VOLUME (ml) OR WEIGHT (g)					IMPINGER		SILICA GEL WEIGHT	
		#1	#2	#3	#4	#5				
FINAL		210	132	0						
INITIAL		100	100	10	56					
LIQUID COLLECTED		110	32							
TOTAL LIQUID COLLECTED (specify ml or g)										



## FIELD DATA

36° ✓  
29.62  
20  
105  
00  
1

PROBE HEATER SETTING	N/A
HEATER BOX SETTING	N/A
METER H <sub>2</sub>	N/A
C <sub>p</sub> FACTOR	0.84
Y <sub>p</sub> FACTOR	1.003
PITOT NO.	

WEIGHT OF PARTICULATE, mg	
Filter No.	
Sample	
Final wt	
Tag wt	
Wt gain	
TOTAL	

PRESSURE DIFFERENTIAL ACROSS METER ORIFICE ( $\Delta H$ ) in. $H_2O$	ACTUAL	DESIRED
--	--------	---------

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME ( $\Theta$ ) min.	STATIC PRESSURE (in. H <sub>2</sub> O)	STACK TEMP (T <sub>s</sub> ) °F	VELOCITY HEAD	
					( $\Delta P_s$ )	( $\Delta P_v$ )
1345		0	-1.95		SEE	
1350		5			VELOCITY	
1355		10			TRAVERSE	
1400		15				
1405		20				
1410		25				
1415		30				
1420		35				
1425		40				
1430		45				
1435		50				
1440		55				
1445		60				

GAS SAMPLE		GAS SAMPLE TEMP AT DRY GAS METER		CROSS SECTION		TOTAL	
GAS SAMPLE VOLUME (N/m <sup>3</sup> )	GAS SAMPLE INLET (T <sub>in</sub> ) °F	GAS SAMPLE OUTLET (T <sub>out</sub> ) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
0.000		70	N/A	N/A	N/A	60	9
2.59		69				60	9
4.91		69				59	9
7.29		70				58	9
9.63		71				60	9
11.98		72				60	9
14.33		72				62	9
16.67		73				63	9
19.02		74				65	9
21.37		75				65	9
23.73		75				66	9
26.09		75				66	9
28.43						66	9

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER					SILICA GEL WEIGHT
	#1	#2	#3	#4	#5	
FINAL	210	124				215.2
INITIAL	100	100	0	56		200
LIQUID COLLECTED	110	24				15.2
TOTAL LIQUID COLLECTED (specify ml or g)						149.2

ORSAT DATA	TIME	CO <sub>2</sub>	O <sub>2</sub>
TRIAL 1		6.6	2.4
TRIAL 2		6.6	2.4
TRIAL 3		6.6	2.4
Average		6.6	2.4

LEAK CHECK	
SYSTEM PRE: <u>0.000</u>	CFM@15"Hg
POST: <u>0.000</u>	CFM@15"Hg
PITOT PRE: <u>✓✓</u>	@ > 3"H <sub>2</sub> O
POST: <u>✓✓</u>	@ > 3"H <sub>2</sub> O



# VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT BP  
DATE 12/12/13  
LOCATION Whiting, IN  
SOURCE FCU 500 stack  
STACK ID 103  
PROBE #/TC # 1139  
BAROMETRIC PRESSURE, in. Hg 29.62  
OPERATORS BO

## SCHEMATIC OF TRAVERSE POINT LAYOUT

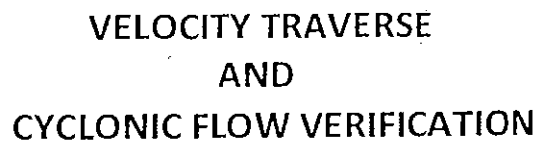
RUN NO. Pre 1  
STATIC, in. H<sub>2</sub>O -1.95  
START: 1035 STOP: 1045  
PRE-TEST: +/- OK POST-TEST: +/- OK

RUN NO. Post 1 / Pre 2  
STATIC, in. H<sub>2</sub>O -1.90  
START: 1150 STOP: 1200  
PRE-TEST: +/- OK POST-TEST: +/- OK

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
1	1.50	647.1	3
2	1.55	646.2	4
3	1.45	647.3	3
4	2.05	647.9	4
5	1.45	647.8	7
6	1.75	648.1	6
7	1.65	647.9	5
8	1.55	648.0	2
9	1.55	647.6	1
10	1.60	648.1	1
11	1.90	648.3	2
12	2.00	647.7	3
13	2.05	647.4	0
14	1.70	648.2	2
15	1.50	647.8	2
16	1.50	647.5	3
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99			
100			
AVERAGE	$\sqrt{\Delta P}$ 1.3337	647.46	

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H <sub>2</sub> O)	STACK TEMP. (°F)	YAW ANGLE (°)
1	1.55	647.2	
2	1.60	647.5	
3	1.90	647.4	
4	2.10	647.8	
5	1.90	648.1	
6	1.70	647.9	
7	1.65	647.7	
8	1.50	648.0	
9	1.45	647.5	
10	1.65	647.8	
11	1.90	648.5	
12	2.10	649.2	
13	2.00	647.7	
14	1.65	647.2	
15	1.50	646.3	
16	1.40	646.8	
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97			
98			
99			
100			
AVERAGE	$\sqrt{\Delta P}$ 1.3095	647.66	

Run 1  
1.3337  
ΔP  
Stack  
647.46



RUN NO. Post 3  
 STATIC, in. H<sub>2</sub>O. 2.00 - 1.95  
 START: 1450 STOP: 1500  
 PRE-TEST: T/- OK POST-TEST: T/- OK

Run 2	1.310 ΔP	647.6 stack	Run 3	1.313 ΔP	647.5 stack
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Form FDF 4005.00  
B-5



# TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting, IN  
Date 12-11-13  
Sampling Location FCU 500 Stack  
Inside of Far Wall to  
Outside of Port (Distance C) 117.8  
Inside of Near Wall to  
Outside of Port (Distance D) 9.8  
Stack ID (Distance C - Distance D) 108  
Port Distance Downstream From Disturbance (B) 1368  
Port Distance Upstream From Disturbance (A) 720  
Equivalent Diameter Downstream From Disturbance (B) 12.7 ( $\geq 2.0$ )  
Equivalent Diameter Upstream From Disturbance (A) 6.7 ( $\geq 0.5$ )  
Number of Ports Used 3 Traverse Points / Port 8

Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) =  
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) =  
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =  
[ $(2 \times L \times W) / (L + W)$ ]

Port ID \_\_\_\_\_ in. (for monorail bracket specs.)  
Port Length Outside of Stack \_\_\_\_\_ in. (for monorail bracket specs.)

1 2 3 4 5 6

Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.032	108	3.46	9.8	13.26
2	0.105		11.34		31.14
3	0.194		20.95		30.75
4	0.323		34.88		44.68
5	0.677		73.12		82.93
6	0.806		87.05		96.85
7	0.995		96.66		106.46
8	0.968		104.54		114.34
9					
10					
11					
12					

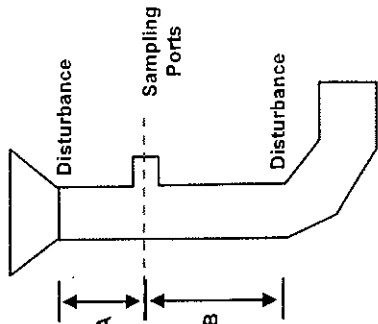
For Stacks / Ducts  $\leq 24$  inches ID - No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts  $> 24$  inches ID - No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check: SAF Legibility SAF Accuracy SAF Specifications SAF

Method 1 Calculator Signature/Date Brett G. Jones 12/11/13

Field Supervisor Signature/Date [Signature] 12/12/13



LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

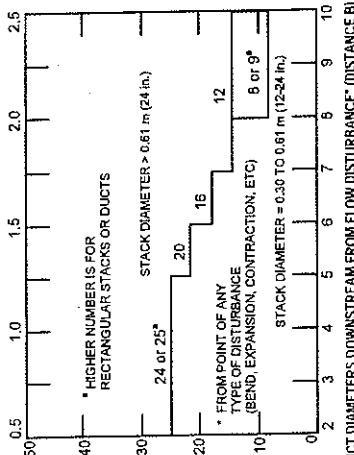
PTS	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	28.8	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5	85.4	67.7	34.2	25.0	
6	95.6	80.6	65.8	35.6	
7	89.5	77.4	64.4		
8	85.4	75.0			
9	91.8	82.3			
10	97.4	86.2			
11					
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS

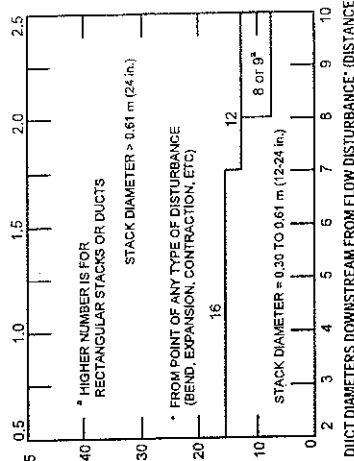
PTS	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3	83.3	62.5	50.0	41.7	35.7	31.3	27.8	
4	87.5	70.0	58.3	50.0	43.8	38.9		
5		90.0	75.0	64.3	56.3	50.0		
6			91.7	78.6	68.6	61.1		
7				92.9	81.3	72.2		
8					93.8	83.3		
9						94.4		

\*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE\* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE\* (DISTANCE B)





BP Whiting Refinery: Whiting, IN

FCCU 500

Test Date: 12/12/13

## **APPENDIX C**

## **ARI Reference Method Monitoring Data**

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## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 9:31:30	0.0	0.3	Calibration - Outlet Total Hydrocarbon (THC)
12/12/2013 9:31:45	0.0	0.3	Zero Air Injection
12/12/2013 9:32:00	0.1	0.3	0.1 ppm THC as CH <sub>4</sub>
12/12/2013 9:32:15	0.1	0.3	
12/12/2013 9:32:30	0.1	0.4	
12/12/2013 9:32:45	0.1	0.4	
12/12/2013 9:33:00	0.0	0.4	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:33:15	0.1	0.4	Zero Air Injection
12/12/2013 9:33:30	0.1	0.4	0.4 ppm CH <sub>4</sub>
12/12/2013 9:33:45	0.1	0.4	
12/12/2013 9:34:00	0.1	0.4	Injection No. 1
12/12/2013 9:34:15	0.1	0.4	
12/12/2013 9:34:30	0.1	0.4	
12/12/2013 9:34:45	0.1	0.4	
12/12/2013 9:35:00	0.1	0.4	
12/12/2013 9:35:15	0.1	0.5	
12/12/2013 9:35:30	0.1	0.6	
12/12/2013 9:35:45	0.1	0.6	
12/12/2013 9:36:00	0.1	0.6	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:36:15	0.1	0.6	Zero Air Injection
12/12/2013 9:36:30	0.1	0.6	0.6 ppm CH <sub>4</sub>
12/12/2013 9:36:45	0.1	0.6	
12/12/2013 9:37:00	0.1	0.6	Injection No. 2
12/12/2013 9:37:15	0.1	0.6	
12/12/2013 9:37:30	0.1	0.6	
12/12/2013 9:37:45	0.1	0.6	
12/12/2013 9:38:00	0.2	0.6	
12/12/2013 9:38:15	0.1	0.4	
12/12/2013 9:38:30	0.1	0.5	
12/12/2013 9:38:45	0.1	0.5	
12/12/2013 9:39:00	0.1	0.5	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:39:15	0.1	0.5	Zero Air Injection
12/12/2013 9:39:30	0.1	0.5	0.5 ppm CH <sub>4</sub>
12/12/2013 9:39:45	0.1	0.5	
12/12/2013 9:40:00	0.1	0.5	Injection No. 3
12/12/2013 9:40:15	0.1	0.5	
12/12/2013 9:40:30	0.1	0.5	Average of Three Injections - Zero
12/12/2013 9:40:45	0.1	0.5	0.5 ppm CH <sub>4</sub>
12/12/2013 9:41:00	0.0	0.5	
12/12/2013 9:41:15	0.1	0.4	
12/12/2013 9:41:30	26.4	0.3	
12/12/2013 9:41:45	44.0	0.3	
12/12/2013 9:42:00	45.3	0.3	
12/12/2013 9:42:15	47.0	0.3	
12/12/2013 9:42:30	47.4	0.3	
12/12/2013 9:42:45	46.4	0.3	
12/12/2013 9:43:00	44.9	0.3	
12/12/2013 9:43:15	44.3	0.3	
12/12/2013 9:43:30	44.0	0.4	
12/12/2013 9:43:45	48.7	0.3	
12/12/2013 9:44:00	49.9	0.4	
12/12/2013 9:44:15	50.0	37.5	Calibration - Outlet THC
12/12/2013 9:44:30	50.1	50.0	50.0 ppm Injection
12/12/2013 9:44:45	50.2	50.0	50.2 ppm THC
12/12/2013 9:45:00	50.2	50.0	
12/12/2013 9:45:15	50.3	50.0	
12/12/2013 9:45:30	50.3	50.0	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:45:45	50.4	50.0	50.0 ppm CH <sub>4</sub> Injection
12/12/2013 9:46:00	50.4	50.0	50.0 ppm CH <sub>4</sub>
12/12/2013 9:46:15	50.4	50.0	
12/12/2013 9:46:30	50.4	50.0	Injection No. 1
12/12/2013 9:46:45	50.5	50.0	
12/12/2013 9:47:00	50.3	50.0	
12/12/2013 9:47:15	50.2	50.4	
12/12/2013 9:47:30	50.1	50.5	
12/12/2013 9:47:45	50.4	50.5	
12/12/2013 9:48:00	50.3	50.5	
12/12/2013 9:48:15	50.2	50.5	
12/12/2013 9:48:30	50.2	50.5	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:48:45	50.3	50.5	50.0 ppm CH <sub>4</sub> Injection
12/12/2013 9:49:00	50.3	50.5	50.5 ppm CH <sub>4</sub>
12/12/2013 9:49:15	50.2	50.5	
12/12/2013 9:49:30	50.2	50.5	Injection No. 2
12/12/2013 9:49:45	50.2	50.5	
12/12/2013 9:50:00	50.2	50.5	
12/12/2013 9:50:15	50.3	50.4	

2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 9:50:30	50.3	50.4	
12/12/2013 9:50:45	50.3	50.4	
12/12/2013 9:51:00	50.3	50.4	
12/12/2013 9:51:15	50.3	50.4	
12/12/2013 9:51:30	50.2	50.4	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 9:51:45	50.3	50.4	50.0 ppm CH <sub>4</sub> Injection
12/12/2013 9:52:00	50.3	50.4	50.4 ppm CH <sub>4</sub>
12/12/2013 9:52:15	50.3	50.4	
12/12/2013 9:52:30	50.6	50.4	Injection No. 3
12/12/2013 9:52:45	50.7	50.4	
12/12/2013 9:53:00	51.0	50.4	Average of Three Injections - 50.0 ppm
12/12/2013 9:53:15	51.0	50.6	50.3 ppm CH <sub>4</sub>
12/12/2013 9:53:30	50.9	50.6	
12/12/2013 9:53:45	50.8	50.6	
12/12/2013 9:54:00	50.5	50.6	
12/12/2013 9:54:15	50.2	50.6	
12/12/2013 9:54:30	50.0	50.6	
12/12/2013 9:54:45	50.0	50.6	
12/12/2013 9:55:00	50.0	50.6	
12/12/2013 9:55:15	50.0	50.6	
12/12/2013 9:55:30	50.0	50.6	
12/12/2013 9:55:45	50.0	50.6	
12/12/2013 9:56:00	49.9	50.6	
12/12/2013 9:56:15	50.3	50.2	
12/12/2013 9:56:30	78.9	50.0	
12/12/2013 9:56:45	83.9	50.0	
12/12/2013 9:57:00	85.0	50.0	
12/12/2013 9:57:15	85.0	50.0	
12/12/2013 9:57:30	84.9	50.0	
12/12/2013 9:57:45	84.9	50.0	
12/12/2013 9:58:00	85.0	50.0	
12/12/2013 9:58:15	85.1	50.0	
12/12/2013 9:58:30	84.9	50.0	
12/12/2013 9:58:45	85.0	50.0	
12/12/2013 9:59:00	85.0	50.0	
12/12/2013 9:59:15	84.9	76.2	Calibration - Outlet THC
12/12/2013 9:59:30	84.8	84.9	84.0 ppm Injection
12/12/2013 9:59:45	84.9	84.9	84.8 ppm THC
12/12/2013 10:00:00	84.8	84.9	
12/12/2013 10:00:15	84.8	84.9	
12/12/2013 10:00:30	84.8	84.9	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:00:45	84.9	84.9	84.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:01:00	84.8	84.9	84.9 ppm CH <sub>4</sub>
12/12/2013 10:01:15	84.8	84.9	
12/12/2013 10:01:30	84.9	84.9	Injection No. 1
12/12/2013 10:01:45	84.9	84.9	
12/12/2013 10:02:00	84.9	84.9	
12/12/2013 10:02:15	84.8	85.1	
12/12/2013 10:02:30	84.7	85.1	
12/12/2013 10:02:45	84.6	85.1	
12/12/2013 10:03:00	84.7	85.1	
12/12/2013 10:03:15	84.6	85.1	
12/12/2013 10:03:30	84.6	85.1	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:03:45	84.5	85.1	84.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:04:00	84.7	85.1	85.1 ppm CH <sub>4</sub>
12/12/2013 10:04:15	84.7	85.1	
12/12/2013 10:04:30	84.8	85.1	Injection No. 2
12/12/2013 10:04:45	84.8	85.1	
12/12/2013 10:05:00	84.7	85.1	
12/12/2013 10:05:15	84.6	84.9	
12/12/2013 10:05:30	84.5	84.8	
12/12/2013 10:05:45	84.3	84.8	
12/12/2013 10:06:00	84.6	84.8	
12/12/2013 10:06:15	84.6	84.8	
12/12/2013 10:06:30	84.8	84.8	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:06:45	84.8	84.8	84.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:07:00	84.7	84.8	84.8 ppm CH <sub>4</sub>
12/12/2013 10:07:15	84.6	84.8	
12/12/2013 10:07:30	84.4	84.8	Injection No. 3
12/12/2013 10:07:45	84.3	84.8	
12/12/2013 10:08:00	84.4	84.8	Average of Three Injections - 84.0 ppm
12/12/2013 10:08:15	84.5	84.9	85.0 ppm CH <sub>4</sub>
12/12/2013 10:08:30	84.7	84.9	
12/12/2013 10:08:45	84.8	84.9	
12/12/2013 10:09:00	84.5	84.9	
12/12/2013 10:09:15	84.1	84.9	

2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 10:09:30	26.0	84.9	
12/12/2013 10:09:45	25.7	84.9	
12/12/2013 10:10:00	25.5	84.9	
12/12/2013 10:10:15	25.4	84.9	
12/12/2013 10:10:30	25.4	84.9	
12/12/2013 10:10:45	25.4	84.9	
12/12/2013 10:11:00	25.3	84.9	Calibration - Outlet THC
12/12/2013 10:11:15	<b>25.3</b>	40.1	25.0 ppm Injection
12/12/2013 10:11:30	<b>25.2</b>	25.1	25.2 ppm THC
12/12/2013 10:11:45	<b>25.2</b>	25.1	
12/12/2013 10:12:00	<b>25.2</b>	25.1	
12/12/2013 10:12:15	25.2	25.1	
12/12/2013 10:12:30	25.2	25.1	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:12:45	25.2	<b>25.1</b>	25.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:13:00	25.2	<b>25.1</b>	25.1 ppm CH <sub>4</sub>
12/12/2013 10:13:15	25.1	<b>25.1</b>	
12/12/2013 10:13:30	25.1	<b>25.1</b>	Injection No. 1
12/12/2013 10:13:45	25.0	25.1	
12/12/2013 10:14:00	25.1	25.1	
12/12/2013 10:14:15	25.1	24.9	
12/12/2013 10:14:30	25.1	24.8	
12/12/2013 10:14:45	25.0	24.8	
12/12/2013 10:15:00	25.0	24.8	
12/12/2013 10:15:15	25.0	24.8	
12/12/2013 10:15:30	25.0	24.8	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:15:45	25.0	<b>24.8</b>	25.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:16:00	25.0	<b>24.8</b>	24.8 ppm CH <sub>4</sub>
12/12/2013 10:16:15	25.0	<b>24.8</b>	
12/12/2013 10:16:30	25.0	<b>24.8</b>	Injection No. 2
12/12/2013 10:16:45	25.0	24.8	
12/12/2013 10:17:00	25.0	24.8	
12/12/2013 10:17:15	25.0	24.7	
12/12/2013 10:17:30	25.0	24.6	
12/12/2013 10:17:45	25.0	24.6	
12/12/2013 10:18:00	25.0	24.6	
12/12/2013 10:18:15	25.0	24.6	
12/12/2013 10:18:30	25.0	24.6	Calibration - Methane (CH <sub>4</sub> )
12/12/2013 10:18:45	24.9	<b>24.6</b>	25.0 ppm CH <sub>4</sub> Injection
12/12/2013 10:19:00	25.0	<b>24.6</b>	24.6 ppm CH <sub>4</sub>
12/12/2013 10:19:15	19.4	<b>24.6</b>	
12/12/2013 10:19:30	1.0	<b>24.6</b>	Injection No. 3
12/12/2013 10:19:45	0.5	24.6	
12/12/2013 10:20:00	0.3	24.6	Average of Three Injections - 25.0 ppm 24.9 ppm CH <sub>4</sub>
12/12/2013 10:20:15	0.3	6.3	
12/12/2013 10:20:30	0.2	0.2	
12/12/2013 10:20:45	<b>0.2</b>	<b>0.2</b>	Response Time
12/12/2013 10:21:00	<b>0.2</b>	<b>0.2</b>	
12/12/2013 10:21:15	<b>0.2</b>	<b>0.2</b>	
12/12/2013 10:21:30	<b>0.2</b>	<b>0.2</b>	
12/12/2013 10:21:45	<b>0.2</b>	<b>0.2</b>	
12/12/2013 10:22:00	<b>1.0</b>	<b>0.2</b>	
12/12/2013 10:22:15	<b>70.4</b>	<b>0.2</b>	
12/12/2013 10:22:30	<b>82.6</b>	<b>0.2</b>	
12/12/2013 10:22:45	83.1	0.2	120 seconds
12/12/2013 10:23:00	83.4	0.2	
12/12/2013 10:23:15	83.5	63.0	
12/12/2013 10:23:30	83.4	84.0	
12/12/2013 10:23:45	83.7	84.0	
12/12/2013 10:24:00	83.7	84.0	
12/12/2013 10:24:15	83.9	84.0	
12/12/2013 10:24:30	56.0	84.0	
12/12/2013 10:24:45	2.2	84.0	
12/12/2013 10:25:00	1.1	84.0	
12/12/2013 10:25:15	0.7	84.0	
12/12/2013 10:25:30	0.6	84.0	
12/12/2013 10:25:45	0.5	84.0	
12/12/2013 10:26:00	0.4	84.0	
12/12/2013 10:26:15	0.3	21.0	
12/12/2013 10:26:30	0.1	0.1	
12/12/2013 10:26:45	0.1	0.1	
12/12/2013 10:27:00	0.1	0.1	
12/12/2013 10:27:15	0.1	0.1	
12/12/2013 10:27:30	<b>0.0</b>	0.1	Response Time
12/12/2013 10:27:45	<b>0.1</b>	0.1	
12/12/2013 10:28:00	<b>0.1</b>	0.1	
12/12/2013 10:28:15	<b>0.1</b>	0.1	

2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 10:28:30	0.1	0.1	
12/12/2013 10:28:45	0.5	0.1	
12/12/2013 10:29:00	67.7	0.1	
12/12/2013 10:29:15	82.8	0.1	120 seconds
12/12/2013 10:29:30	83.3	0.1	
12/12/2013 10:29:45	83.6	0.1	
12/12/2013 10:30:00	83.7	0.1	
12/12/2013 10:30:15	83.8	0.1	
12/12/2013 10:30:30	83.9	0.1	
12/12/2013 10:30:45	84.0	63.4	
12/12/2013 10:31:00	83.9	84.6	
12/12/2013 10:31:15	50.8	84.6	
12/12/2013 10:31:30	2.0	84.6	
12/12/2013 10:31:45	1.1	84.6	
12/12/2013 10:32:00	0.8	84.6	
12/12/2013 10:32:15	0.6	84.6	Response Time
12/12/2013 10:32:30	0.5	84.6	
12/12/2013 10:32:45	0.5	84.6	
12/12/2013 10:33:00	0.4	84.6	
12/12/2013 10:33:15	0.8	84.6	
12/12/2013 10:33:30	68.8	84.6	
12/12/2013 10:33:45	82.9	21.2	105 seconds
12/12/2013 10:34:00	83.3	0.1	Response Time
12/12/2013 10:34:15	83.8	0.1	Average of Three Injections
12/12/2013 10:34:30	83.8	0.1	115.0 seconds
12/12/2013 10:34:45	83.9	0.1	
12/12/2013 10:35:00	84.2	0.8	
12/12/2013 10:35:15	84.3	0.8	
12/12/2013 10:35:30	84.2	0.8	
12/12/2013 10:35:45	84.1	0.8	
12/12/2013 10:36:00	84.1	0.8	
12/12/2013 10:36:15	84.1	0.8	
12/12/2013 10:36:30	83.9	0.8	
12/12/2013 10:36:45	84.0	0.8	
12/12/2013 10:37:00	84.1	0.8	
12/12/2013 10:37:15	84.1	0.8	
12/12/2013 10:37:30	84.0	0.8	
12/12/2013 10:37:45	84.0	0.8	
12/12/2013 10:38:00	84.0	7.2	
12/12/2013 10:38:15	83.9	0.8	
12/12/2013 10:38:30	83.9	21.6	
12/12/2013 10:38:45	83.9	84.1	
12/12/2013 10:39:00	46.5	84.1	
12/12/2013 10:39:15	26.0	84.1	
12/12/2013 10:39:30	68.0	84.1	
12/12/2013 10:39:45	5.1	84.1	
12/12/2013 10:40:00	1.8	84.1	
12/12/2013 10:40:15	1.2	84.1	
12/12/2013 10:40:30	0.9	84.1	
12/12/2013 10:40:45	0.7	84.1	
12/12/2013 10:41:00	0.5	84.1	
12/12/2013 10:41:15	0.4	84.1	
12/12/2013 10:41:30	0.3	84.1	
12/12/2013 10:41:45	0.2	84.1	
12/12/2013 10:42:00	0.1	84.1	
12/12/2013 10:42:15	0.0	22.4	
12/12/2013 10:42:30	0.0	1.9	
12/12/2013 10:42:45	3.1	1.9	
12/12/2013 10:43:00	3.0	1.9	
12/12/2013 10:43:15	3.0	1.9	
12/12/2013 10:43:30	2.9	1.9	
12/12/2013 10:43:45	2.9	1.9	
12/12/2013 10:44:00	2.9	1.9	
12/12/2013 10:44:15	2.8	1.9	
12/12/2013 10:44:30	2.8	1.9	
12/12/2013 10:44:45	2.8	1.9	
12/12/2013 10:45:00	2.7	1.9	Start Run 1
12/12/2013 10:45:15	2.9	1.9	Point 1
12/12/2013 10:45:30	2.8	1.9	
12/12/2013 10:45:45	3.0	1.9	
12/12/2013 10:46:00	2.4	1.9	
12/12/2013 10:46:15	3.3	1.4	
12/12/2013 10:46:30	3.6	1.2	
12/12/2013 10:46:45	3.6	1.2	
12/12/2013 10:47:00	3.6	1.2	
12/12/2013 10:47:15	3.5	1.2	

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 10:47:30	3.4	1.2	
12/12/2013 10:47:45	3.4	1.2	
12/12/2013 10:48:00	3.3	1.2	
12/12/2013 10:48:15	3.3	1.2	
12/12/2013 10:48:30	3.3	1.2	
12/12/2013 10:48:45	3.3	1.2	
12/12/2013 10:49:00	3.2	1.2	
12/12/2013 10:49:15	3.2	1.2	
12/12/2013 10:49:30	3.1	1.2	
12/12/2013 10:49:45	3.1	1.2	
12/12/2013 10:50:00	3.0	1.2	
12/12/2013 10:50:15	3.0	1.2	
12/12/2013 10:50:30	2.9	1.1	
12/12/2013 10:50:45	2.9	1.1	
12/12/2013 10:51:00	2.9	1.1	
12/12/2013 10:51:15	2.8	1.1	
12/12/2013 10:51:30	2.8	1.1	
12/12/2013 10:51:45	2.8	1.1	
12/12/2013 10:52:00	2.7	1.1	
12/12/2013 10:52:15	2.7	1.1	
12/12/2013 10:52:30	2.7	1.1	
12/12/2013 10:52:45	2.7	1.1	
12/12/2013 10:53:00	2.6	1.1	
12/12/2013 10:53:15	2.6	1.1	
12/12/2013 10:53:30	2.6	1.1	
12/12/2013 10:53:45	2.6	1.1	
12/12/2013 10:54:00	2.6	1.1	
12/12/2013 10:54:15	2.5	1.1	
12/12/2013 10:54:30	2.5	1.1	
12/12/2013 10:54:45	2.4	1.1	
12/12/2013 10:55:00	2.5	1.1	
12/12/2013 10:55:15	2.4	1.1	
12/12/2013 10:55:30	2.4	1.1	
12/12/2013 10:55:45	2.4	1.1	
12/12/2013 10:56:00	2.3	1.1	
12/12/2013 10:56:15	2.3	1.1	
12/12/2013 10:56:30	2.3	1.1	
12/12/2013 10:56:45	2.3	1.1	
12/12/2013 10:57:00	2.3	1.1	
12/12/2013 10:57:15	2.2	1.1	
12/12/2013 10:57:30	2.3	1.1	
12/12/2013 10:57:45	2.3	1.1	
12/12/2013 10:58:00	2.3	1.1	
12/12/2013 10:58:15	2.3	1.1	
12/12/2013 10:58:30	2.2	1.1	
12/12/2013 10:58:45	2.3	1.1	
12/12/2013 10:59:00	2.2	1.1	
12/12/2013 10:59:15	2.2	1.1	
12/12/2013 10:59:30	2.2	1.1	
12/12/2013 10:59:45	2.2	1.1	
12/12/2013 11:00:00	2.2	1.1	
12/12/2013 11:00:15	2.2	1.1	
12/12/2013 11:00:30	2.2	1.1	
12/12/2013 11:00:45	2.3	1.1	
12/12/2013 11:01:00	2.3	1.1	
12/12/2013 11:01:15	2.3	1.1	
12/12/2013 11:01:30	2.3	1.1	
12/12/2013 11:01:45	2.3	1.1	
12/12/2013 11:02:00	2.2	1.1	
12/12/2013 11:02:15	2.2	1.2	
12/12/2013 11:02:30	2.2	1.2	
12/12/2013 11:02:45	2.2	1.2	
12/12/2013 11:03:00	2.2	1.2	
12/12/2013 11:03:15	2.3	1.2	
12/12/2013 11:03:30	2.2	1.2	
12/12/2013 11:03:45	2.2	1.2	
12/12/2013 11:04:00	2.2	1.2	
12/12/2013 11:04:15	2.2	1.2	
12/12/2013 11:04:30	2.4	1.2	
12/12/2013 11:04:45	2.5	1.2	
12/12/2013 11:05:00	2.6	1.2	Point 2
12/12/2013 11:05:15	2.8	1.2	
12/12/2013 11:05:30	3.2	1.2	
12/12/2013 11:05:45	3.8	1.2	
12/12/2013 11:06:00	3.8	1.2	
12/12/2013 11:06:15	5.3	1.3	

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 11:06:30	5.8	1.3
12/12/2013 11:06:45	6.1	1.3
12/12/2013 11:07:00	5.9	1.3
12/12/2013 11:07:15	5.9	1.3
12/12/2013 11:07:30	5.8	1.3
12/12/2013 11:07:45	5.8	1.3
12/12/2013 11:08:00	6.0	1.3
12/12/2013 11:08:15	5.8	1.3
12/12/2013 11:08:30	5.4	1.3
12/12/2013 11:08:45	5.1	1.3
12/12/2013 11:09:00	4.8	1.3
12/12/2013 11:09:15	4.8	1.3
12/12/2013 11:09:30	4.8	1.3
12/12/2013 11:09:45	4.6	1.3
12/12/2013 11:10:00	4.8	1.3
12/12/2013 11:10:15	4.5	1.4
12/12/2013 11:10:30	4.4	1.4
12/12/2013 11:10:45	4.2	1.4
12/12/2013 11:11:00	4.1	1.4
12/12/2013 11:11:15	3.9	1.4
12/12/2013 11:11:30	3.9	1.4
12/12/2013 11:11:45	3.9	1.4
12/12/2013 11:12:00	3.8	1.4
12/12/2013 11:12:15	3.7	1.4
12/12/2013 11:12:30	3.6	1.4
12/12/2013 11:12:45	3.5	1.4
12/12/2013 11:13:00	3.4	1.4
12/12/2013 11:13:15	3.5	1.4
12/12/2013 11:13:30	3.4	1.4
12/12/2013 11:13:45	3.4	1.4
12/12/2013 11:14:00	3.2	1.4
12/12/2013 11:14:15	3.1	1.5
12/12/2013 11:14:30	3.1	1.5
12/12/2013 11:14:45	3.1	1.5
12/12/2013 11:15:00	3.0	1.5
12/12/2013 11:15:15	3.0	1.5
12/12/2013 11:15:30	2.9	1.5
12/12/2013 11:15:45	3.0	1.5
12/12/2013 11:16:00	2.9	1.5
12/12/2013 11:16:15	2.9	1.5
12/12/2013 11:16:30	2.8	1.5
12/12/2013 11:16:45	2.8	1.5
12/12/2013 11:17:00	2.8	1.5
12/12/2013 11:17:15	2.9	1.5
12/12/2013 11:17:30	2.7	1.5
12/12/2013 11:17:45	2.8	1.5
12/12/2013 11:18:00	2.7	1.5
12/12/2013 11:18:15	2.6	1.6
12/12/2013 11:18:30	2.7	1.6
12/12/2013 11:18:45	2.7	1.6
12/12/2013 11:19:00	2.6	1.6
12/12/2013 11:19:15	2.6	1.6
12/12/2013 11:19:30	2.5	1.6
12/12/2013 11:19:45	2.5	1.6
12/12/2013 11:20:00	2.3	1.6
12/12/2013 11:20:15	2.4	1.6
12/12/2013 11:20:30	2.5	1.6
12/12/2013 11:20:45	2.4	1.6
12/12/2013 11:21:00	2.3	1.6
12/12/2013 11:21:15	2.4	1.6
12/12/2013 11:21:30	2.4	1.6
12/12/2013 11:21:45	2.3	1.6
12/12/2013 11:22:00	2.3	1.6
12/12/2013 11:22:15	2.2	1.6
12/12/2013 11:22:30	2.2	1.6
12/12/2013 11:22:45	2.2	1.6
12/12/2013 11:23:00	2.2	1.6
12/12/2013 11:23:15	2.1	1.6
12/12/2013 11:23:30	2.2	1.6
12/12/2013 11:23:45	2.4	1.6
12/12/2013 11:24:00	2.2	1.6
12/12/2013 11:24:15	2.1	1.6
12/12/2013 11:24:30	2.2	1.6
12/12/2013 11:24:45	2.1	1.6
12/12/2013 11:25:00	2.0	1.6
12/12/2013 11:25:15	2.0	1.6

Point 3

Span Units <u>Date / Time</u>	0-100 ppmv wb <u>Stack THC</u>	0-100 ppmv wb <u>Stack CH<sub>4</sub></u>
12/12/2013 11:25:30	2.1	1.6
12/12/2013 11:25:45	2.2	1.6
12/12/2013 11:26:00	2.4	1.6
12/12/2013 11:26:15	2.5	1.7
12/12/2013 11:26:30	2.4	1.7
12/12/2013 11:26:45	2.3	1.7
12/12/2013 11:27:00	2.2	1.7
12/12/2013 11:27:15	2.1	1.7
12/12/2013 11:27:30	2.2	1.7
12/12/2013 11:27:45	2.4	1.7
12/12/2013 11:28:00	2.3	1.7
12/12/2013 11:28:15	2.2	1.7
12/12/2013 11:28:30	2.2	1.7
12/12/2013 11:28:45	2.2	1.7
12/12/2013 11:29:00	2.1	1.7
12/12/2013 11:29:15	2.2	1.7
12/12/2013 11:29:30	2.2	1.7
12/12/2013 11:29:45	2.1	1.7
12/12/2013 11:30:00	2.2	1.7
12/12/2013 11:30:15	2.1	1.8
12/12/2013 11:30:30	2.1	1.8
12/12/2013 11:30:45	2.0	1.8
12/12/2013 11:31:00	2.0	1.8
12/12/2013 11:31:15	2.1	1.8
12/12/2013 11:31:30	2.1	1.8
12/12/2013 11:31:45	2.0	1.8
12/12/2013 11:32:00	2.0	1.8
12/12/2013 11:32:15	2.0	1.8
12/12/2013 11:32:30	1.9	1.8
12/12/2013 11:32:45	2.0	1.8
12/12/2013 11:33:00	1.9	1.8
12/12/2013 11:33:15	1.9	1.8
12/12/2013 11:33:30	1.8	1.8
12/12/2013 11:33:45	1.8	1.8
12/12/2013 11:34:00	1.9	1.8
12/12/2013 11:34:15	1.9	1.8
12/12/2013 11:34:30	1.8	1.8
12/12/2013 11:34:45	1.8	1.8
12/12/2013 11:35:00	1.9	1.8
12/12/2013 11:35:15	1.8	1.8
12/12/2013 11:35:30	1.8	1.8
12/12/2013 11:35:45	1.8	1.8
12/12/2013 11:36:00	1.7	1.8
12/12/2013 11:36:15	1.8	1.8
12/12/2013 11:36:30	1.7	1.8
12/12/2013 11:36:45	1.7	1.8
12/12/2013 11:37:00	1.7	1.8
12/12/2013 11:37:15	1.6	1.8
12/12/2013 11:37:30	1.6	1.8
12/12/2013 11:37:45	1.5	1.8
12/12/2013 11:38:00	1.6	1.8
12/12/2013 11:38:15	1.6	1.8
12/12/2013 11:38:30	1.6	1.7
12/12/2013 11:38:45	1.6	1.7
12/12/2013 11:39:00	1.6	1.7
12/12/2013 11:39:15	1.8	1.7
12/12/2013 11:39:30	1.8	1.7
12/12/2013 11:39:45	1.7	1.7
12/12/2013 11:40:00	1.7	1.7
12/12/2013 11:40:15	1.7	1.7
12/12/2013 11:40:30	1.8	1.7
12/12/2013 11:40:45	1.8	1.7
12/12/2013 11:41:00	1.8	1.7
12/12/2013 11:41:15	1.7	1.7
12/12/2013 11:41:30	1.7	1.7
12/12/2013 11:41:45	1.7	1.7
12/12/2013 11:42:00	1.7	1.7
12/12/2013 11:42:15	1.6	1.8
12/12/2013 11:42:30	1.5	1.8
12/12/2013 11:42:45	1.5	1.8
12/12/2013 11:43:00	1.4	1.8
12/12/2013 11:43:15	1.5	1.8
12/12/2013 11:43:30	1.4	1.8
12/12/2013 11:43:45	1.4	1.8
12/12/2013 11:44:00	1.5	1.8
12/12/2013 11:44:15	1.5	1.8

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 11:44:30	1.5	1.8	
12/12/2013 11:44:45	1.5	1.8	
12/12/2013 11:45:00	1.5	1.8	
12/12/2013 11:45:15	1.5	1.8	
12/12/2013 11:45:30	1.5	1.8	
12/12/2013 11:45:45	1.4	1.8	
12/12/2013 11:46:00	1.5	1.8	
12/12/2013 11:46:15	1.5	1.9	
12/12/2013 11:46:30	1.5	1.9	
12/12/2013 11:46:45	1.5	1.9	
12/12/2013 11:47:00	1.5	1.9	
12/12/2013 11:47:15	1.5	1.9	
12/12/2013 11:47:30	1.5	1.9	
12/12/2013 11:47:45	1.5	1.9	
12/12/2013 11:48:00	1.5	1.9	
12/12/2013 11:48:15	1.2	1.9	
12/12/2013 11:48:30	0.9	1.9	
12/12/2013 11:48:45	0.6	1.9	
12/12/2013 11:49:00	0.5	1.9	
12/12/2013 11:49:15	0.3	1.9	
12/12/2013 11:49:30	0.2	1.9	
12/12/2013 11:49:45	0.2	1.9	
12/12/2013 11:50:00	0.2	1.9	
12/12/2013 11:50:15	0.1	0.5	
12/12/2013 11:50:30	0.1	0.5	Calibration - Outlet THC
12/12/2013 11:50:45	0.1	0.5	Zero Air Injection
12/12/2013 11:51:00	0.1	0.5	0.1 ppm THC
12/12/2013 11:51:15	0.1	0.5	
12/12/2013 11:51:30	0.0	0.5	
12/12/2013 11:51:45	0.0	0.5	
12/12/2013 11:52:00	0.0	0.5	
12/12/2013 11:52:15	0.0	0.5	
12/12/2013 11:52:30	0.0	0.5	
12/12/2013 11:52:45	0.0	0.5	
12/12/2013 11:53:00	0.0	0.5	
12/12/2013 11:53:15	0.0	0.5	
12/12/2013 11:53:30	0.0	0.5	
12/12/2013 11:53:45	0.0	0.5	
12/12/2013 11:54:00	0.0	0.5	
12/12/2013 11:54:15	0.0	0.6	
12/12/2013 11:54:30	0.0	0.6	
12/12/2013 11:54:45	1.0	0.6	
12/12/2013 11:55:00	1.1	0.6	
12/12/2013 11:55:15	0.9	0.6	
12/12/2013 11:55:30	31.0	0.6	
12/12/2013 11:55:45	80.6	0.6	
12/12/2013 11:56:00	49.0	0.6	
12/12/2013 11:56:15	49.1	0.6	
12/12/2013 11:56:30	49.3	0.6	
12/12/2013 11:56:45	49.4	0.6	
12/12/2013 11:57:00	49.4	0.6	
12/12/2013 11:57:15	49.5	0.6	
12/12/2013 11:57:30	49.5	0.6	
12/12/2013 11:57:45	49.4	0.6	
12/12/2013 11:58:00	49.4	0.6	
12/12/2013 11:58:15	49.5	25.7	Calibration - Outlet THC
12/12/2013 11:58:30	49.6	50.1	50.0 ppm Injection
12/12/2013 11:58:45	49.6	50.1	49.6 ppm THC
12/12/2013 11:59:00	49.7	50.1	
12/12/2013 11:59:15	49.5	50.1	
12/12/2013 11:59:30	49.6	50.1	
12/12/2013 11:59:45	49.6	50.1	
12/12/2013 12:00:00	49.6	50.1	
12/12/2013 12:00:15	49.5	50.1	
12/12/2013 12:00:30	48.7	50.1	
12/12/2013 12:00:45	48.0	50.1	
12/12/2013 12:01:00	47.8	50.1	
12/12/2013 12:01:15	47.8	50.1	
12/12/2013 12:01:30	47.7	50.1	
12/12/2013 12:01:45	47.6	50.1	
12/12/2013 12:02:00	47.7	50.1	
12/12/2013 12:02:15	47.6	47.8	
12/12/2013 12:02:30	47.6	47.8	
12/12/2013 12:02:45	47.6	47.8	
12/12/2013 12:03:00	47.7	47.8	
12/12/2013 12:03:15	47.7	47.8	

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 12:03:30	47.5	47.8
12/12/2013 12:03:45	29.9	47.8
12/12/2013 12:04:00	8.5	47.8
12/12/2013 12:04:15	35.0	47.8
12/12/2013 12:04:30	52.2	47.8
12/12/2013 12:04:45	3.6	47.8
12/12/2013 12:05:00	2.1	47.8
12/12/2013 12:05:15	1.7	47.8
12/12/2013 12:05:30	2.5	47.8
12/12/2013 12:05:45	2.7	47.8
12/12/2013 12:06:00	2.8	47.8
12/12/2013 12:06:15	2.8	2.6
12/12/2013 12:06:30	2.9	2.5
12/12/2013 12:06:45	3.0	2.5
12/12/2013 12:07:00	3.0	2.5
12/12/2013 12:07:15	3.1	2.5
12/12/2013 12:07:30	3.1	2.5
12/12/2013 12:07:45	3.1	2.5
12/12/2013 12:08:00	3.2	2.5
12/12/2013 12:08:15	3.1	2.5
12/12/2013 12:08:30	3.2	2.5
12/12/2013 12:08:45	3.1	2.5
12/12/2013 12:09:00	3.2	2.5
12/12/2013 12:09:15	3.1	2.5
12/12/2013 12:09:30	3.2	2.5
12/12/2013 12:09:45	3.2	2.5
12/12/2013 12:10:00	3.2	2.5
12/12/2013 12:10:15	3.2	2.2
12/12/2013 12:10:30	3.2	2.2
12/12/2013 12:10:45	3.3	2.2
12/12/2013 12:11:00	3.2	2.2
12/12/2013 12:11:15	3.3	2.2
12/12/2013 12:11:30	3.3	2.2
12/12/2013 12:11:45	3.3	2.2
12/12/2013 12:12:00	3.3	2.2
12/12/2013 12:12:15	3.3	2.2
12/12/2013 12:12:30	3.3	2.2
12/12/2013 12:12:45	3.3	2.2
12/12/2013 12:13:00	3.3	2.2
12/12/2013 12:13:15	3.4	2.2
12/12/2013 12:13:30	3.4	2.2
12/12/2013 12:13:45	3.4	2.2
12/12/2013 12:14:00	3.4	2.2
12/12/2013 12:14:15	3.3	2.3
12/12/2013 12:14:30	3.3	2.3
12/12/2013 12:14:45	3.3	2.3
12/12/2013 12:15:00	3.2	2.3
12/12/2013 12:15:15	3.2	2.3
12/12/2013 12:15:30	3.2	2.3
12/12/2013 12:15:45	3.2	2.3
12/12/2013 12:16:00	3.2	2.3
12/12/2013 12:16:15	3.2	2.3
12/12/2013 12:16:30	3.1	2.3
12/12/2013 12:16:45	3.1	2.3
12/12/2013 12:17:00	3.1	2.3
12/12/2013 12:17:15	3.2	2.3
12/12/2013 12:17:30	3.3	2.3
12/12/2013 12:17:45	3.2	2.3
12/12/2013 12:18:00	3.2	2.3
12/12/2013 12:18:15	3.2	2.3
12/12/2013 12:18:30	3.4	2.3
12/12/2013 12:18:45	3.3	2.3
12/12/2013 12:19:00	3.3	2.3
12/12/2013 12:19:15	3.3	2.3
12/12/2013 12:19:30	3.2	2.3
12/12/2013 12:19:45	3.2	2.3
12/12/2013 12:20:00	3.2	2.3
12/12/2013 12:20:15	3.2	2.3
12/12/2013 12:20:30	3.2	2.3
12/12/2013 12:20:45	3.2	2.3
12/12/2013 12:21:00	3.2	2.3
12/12/2013 12:21:15	3.2	2.3
12/12/2013 12:21:30	3.1	2.3
12/12/2013 12:21:45	3.1	2.3
12/12/2013 12:22:00	3.2	2.3
12/12/2013 12:22:15	3.2	2.3

Run 2

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 12:22:30	3.1	2.3
12/12/2013 12:22:45	3.0	2.3
12/12/2013 12:23:00	3.0	2.3
12/12/2013 12:23:15	3.0	2.3
12/12/2013 12:23:30	2.9	2.3
12/12/2013 12:23:45	2.9	2.3
12/12/2013 12:24:00	2.9	2.3
12/12/2013 12:24:15	2.9	2.3
12/12/2013 12:24:30	2.9	2.3
12/12/2013 12:24:45	2.9	2.3
12/12/2013 12:25:00	3.0	2.3
12/12/2013 12:25:15	3.0	2.3
12/12/2013 12:25:30	2.8	2.3
12/12/2013 12:25:45	2.9	2.3
12/12/2013 12:26:00	3.0	2.3
12/12/2013 12:26:15	2.9	2.3
12/12/2013 12:26:30	2.8	2.3
12/12/2013 12:26:45	2.8	2.3
12/12/2013 12:27:00	3.0	2.3
12/12/2013 12:27:15	2.8	2.3
12/12/2013 12:27:30	2.8	2.3
12/12/2013 12:27:45	2.8	2.3
12/12/2013 12:28:00	2.8	2.3
12/12/2013 12:28:15	2.7	2.3
12/12/2013 12:28:30	2.8	2.3
12/12/2013 12:28:45	2.8	2.3
12/12/2013 12:29:00	2.9	2.3
12/12/2013 12:29:15	2.8	2.3
12/12/2013 12:29:30	3.2	2.3
12/12/2013 12:29:45	3.5	2.3
12/12/2013 12:30:00	5.7	2.3
12/12/2013 12:30:15	9.2	2.2
12/12/2013 12:30:30	9.0	2.2
12/12/2013 12:30:45	7.8	2.2
12/12/2013 12:31:00	7.0	2.2
12/12/2013 12:31:15	6.4	2.2
12/12/2013 12:31:30	5.8	2.2
12/12/2013 12:31:45	5.5	2.2
12/12/2013 12:32:00	5.4	2.2
12/12/2013 12:32:15	5.2	2.2
12/12/2013 12:32:30	5.0	2.2
12/12/2013 12:32:45	4.8	2.2
12/12/2013 12:33:00	4.8	2.2
12/12/2013 12:33:15	4.7	2.2
12/12/2013 12:33:30	4.6	2.2
12/12/2013 12:33:45	4.6	2.2
12/12/2013 12:34:00	4.5	2.2
12/12/2013 12:34:15	4.5	2.4
12/12/2013 12:34:30	4.3	2.4
12/12/2013 12:34:45	4.2	2.4
12/12/2013 12:35:00	4.0	2.4
12/12/2013 12:35:15	4.0	2.4
12/12/2013 12:35:30	3.9	2.4
12/12/2013 12:35:45	4.0	2.4
12/12/2013 12:36:00	3.9	2.4
12/12/2013 12:36:15	3.9	2.4
12/12/2013 12:36:30	4.0	2.4
12/12/2013 12:36:45	3.8	2.4
12/12/2013 12:37:00	3.9	2.4
12/12/2013 12:37:15	3.8	2.4
12/12/2013 12:37:30	3.8	2.4
12/12/2013 12:37:45	3.8	2.4
12/12/2013 12:38:00	3.7	2.4
12/12/2013 12:38:15	3.7	2.4
12/12/2013 12:38:30	3.7	2.4
12/12/2013 12:38:45	3.7	2.4
12/12/2013 12:39:00	3.6	2.4
12/12/2013 12:39:15	3.6	2.4
12/12/2013 12:39:30	3.6	2.4
12/12/2013 12:39:45	3.6	2.4
12/12/2013 12:40:00	3.7	2.4
12/12/2013 12:40:15	3.7	2.4
12/12/2013 12:40:30	3.7	2.4
12/12/2013 12:40:45	3.7	2.4
12/12/2013 12:41:00	3.7	2.4
12/12/2013 12:41:15	3.6	2.4

Span Units <u>Date / Time</u>	0-100 ppmv wb <u>Stack THC</u>	0-100 ppmv wb <u>Stack CH<sub>4</sub></u>
12/12/2013 12:41:30	4.1	2.4
12/12/2013 12:41:45	4.9	2.4
12/12/2013 12:42:00	5.4	2.4
12/12/2013 12:42:15	5.2	2.4
12/12/2013 12:42:30	5.0	2.4
12/12/2013 12:42:45	4.8	2.4
12/12/2013 12:43:00	4.5	2.4
12/12/2013 12:43:15	4.3	2.4
12/12/2013 12:43:30	4.2	2.4
12/12/2013 12:43:45	4.1	2.4
12/12/2013 12:44:00	4.0	2.4
12/12/2013 12:44:15	4.0	2.4
12/12/2013 12:44:30	3.9	2.4
12/12/2013 12:44:45	3.8	2.4
12/12/2013 12:45:00	3.7	2.4
12/12/2013 12:45:15	3.7	2.4
12/12/2013 12:45:30	3.6	2.4
12/12/2013 12:45:45	3.5	2.4
12/12/2013 12:46:00	3.5	2.4
12/12/2013 12:46:15	3.6	2.4
12/12/2013 12:46:30	3.5	2.4
12/12/2013 12:46:45	3.6	2.4
12/12/2013 12:47:00	3.7	2.4
12/12/2013 12:47:15	3.7	2.4
12/12/2013 12:47:30	3.8	2.4
12/12/2013 12:47:45	3.9	2.4
12/12/2013 12:48:00	3.8	2.4
12/12/2013 12:48:15	3.8	2.4
12/12/2013 12:48:30	3.7	2.4
12/12/2013 12:48:45	3.8	2.4
12/12/2013 12:49:00	3.8	2.4
12/12/2013 12:49:15	3.8	2.4
12/12/2013 12:49:30	3.8	2.4
12/12/2013 12:49:45	3.7	2.4
12/12/2013 12:50:00	3.7	2.4
12/12/2013 12:50:15	3.7	2.4
12/12/2013 12:50:30	3.6	2.4
12/12/2013 12:50:45	3.7	2.4
12/12/2013 12:51:00	3.7	2.4
12/12/2013 12:51:15	3.6	2.4
12/12/2013 12:51:30	3.5	2.4
12/12/2013 12:51:45	3.5	2.4
12/12/2013 12:52:00	3.5	2.4
12/12/2013 12:52:15	3.5	2.4
12/12/2013 12:52:30	3.4	2.4
12/12/2013 12:52:45	3.4	2.4
12/12/2013 12:53:00	3.4	2.4
12/12/2013 12:53:15	3.3	2.4
12/12/2013 12:53:30	3.2	2.4
12/12/2013 12:53:45	3.2	2.4
12/12/2013 12:54:00	3.2	2.4
12/12/2013 12:54:15	3.3	2.3
12/12/2013 12:54:30	3.2	2.3
12/12/2013 12:54:45	3.2	2.3
12/12/2013 12:55:00	3.2	2.3
12/12/2013 12:55:15	3.2	2.3
12/12/2013 12:55:30	3.8	2.3
12/12/2013 12:55:45	3.8	2.3
12/12/2013 12:56:00	3.8	2.3
12/12/2013 12:56:15	3.8	2.3
12/12/2013 12:56:30	3.6	2.3
12/12/2013 12:56:45	3.5	2.3
12/12/2013 12:57:00	3.5	2.3
12/12/2013 12:57:15	3.4	2.3
12/12/2013 12:57:30	3.3	2.3
12/12/2013 12:57:45	3.4	2.3
12/12/2013 12:58:00	3.4	2.3
12/12/2013 12:58:15	3.4	2.2
12/12/2013 12:58:30	3.4	2.2
12/12/2013 12:58:45	3.4	2.2
12/12/2013 12:59:00	3.3	2.2
12/12/2013 12:59:15	3.2	2.2
12/12/2013 12:59:30	3.2	2.2
12/12/2013 12:59:45	3.1	2.2
12/12/2013 13:00:00	3.0	2.2
12/12/2013 13:00:15	3.1	2.2

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units <u>Date / Time</u>	0-100 ppmv wb <u>Stack THC</u>	0-100 ppmv wb <u>Stack CH<sub>4</sub></u>
12/12/2013 13:00:30	3.1	2.2
12/12/2013 13:00:45	3.1	2.2
12/12/2013 13:01:00	3.3	2.2
12/12/2013 13:01:15	3.5	2.2
12/12/2013 13:01:30	3.6	2.2
12/12/2013 13:01:45	3.8	2.2
12/12/2013 13:02:00	3.4	2.2
12/12/2013 13:02:15	3.3	2.2
12/12/2013 13:02:30	3.2	2.2
12/12/2013 13:02:45	3.2	2.2
12/12/2013 13:03:00	3.3	2.2
12/12/2013 13:03:15	3.2	2.2
12/12/2013 13:03:30	3.2	2.2
12/12/2013 13:03:45	3.2	2.2
12/12/2013 13:04:00	3.1	2.2
12/12/2013 13:04:15	3.2	2.2
12/12/2013 13:04:30	3.2	2.2
12/12/2013 13:04:45	3.4	2.2
12/12/2013 13:05:00	3.6	2.2
12/12/2013 13:05:15	3.6	2.2
12/12/2013 13:05:30	3.6	2.2
12/12/2013 13:05:45	3.5	2.2
12/12/2013 13:06:00	3.4	2.2
12/12/2013 13:06:15	3.3	2.1
12/12/2013 13:06:30	3.3	2.1
12/12/2013 13:06:45	3.2	2.1
12/12/2013 13:07:00	3.2	2.1
12/12/2013 13:07:15	3.1	2.1
12/12/2013 13:07:30	3.1	2.1
12/12/2013 13:07:45	3.1	2.1
12/12/2013 13:08:00	3.1	2.1
12/12/2013 13:08:15	3.4	2.1
12/12/2013 13:08:30	3.6	2.1
12/12/2013 13:08:45	3.5	2.1
12/12/2013 13:09:00	3.6	2.1
12/12/2013 13:09:15	3.5	2.1
12/12/2013 13:09:30	3.5	2.1
12/12/2013 13:09:45	3.4	2.1
12/12/2013 13:10:00	3.4	2.1
12/12/2013 13:10:15	3.4	2.1
12/12/2013 13:10:30	3.3	2.1
12/12/2013 13:10:45	3.3	2.1
12/12/2013 13:11:00	3.3	2.1
12/12/2013 13:11:15	3.2	2.1
12/12/2013 13:11:30	3.3	2.1
12/12/2013 13:11:45	3.2	2.1
12/12/2013 13:12:00	3.2	2.1
12/12/2013 13:12:15	3.1	2.1
12/12/2013 13:12:30	3.1	2.1
12/12/2013 13:12:45	3.0	2.1
12/12/2013 13:13:00	3.0	2.1
12/12/2013 13:13:15	3.0	2.1
12/12/2013 13:13:30	3.0	2.1
12/12/2013 13:13:45	3.0	2.1
12/12/2013 13:14:00	3.0	2.1
12/12/2013 13:14:15	3.0	2.2
12/12/2013 13:14:30	3.0	2.2
12/12/2013 13:14:45	3.3	2.2
12/12/2013 13:15:00	3.5	2.2
12/12/2013 13:15:15	3.6	2.2
12/12/2013 13:15:30	3.5	2.2
12/12/2013 13:15:45	3.3	2.2
12/12/2013 13:16:00	3.1	2.2
12/12/2013 13:16:15	3.1	2.2
12/12/2013 13:16:30	3.0	2.2
12/12/2013 13:16:45	2.9	2.2
12/12/2013 13:17:00	2.9	2.2
12/12/2013 13:17:15	2.8	2.2
12/12/2013 13:17:30	2.8	2.2
12/12/2013 13:17:45	2.7	2.2
12/12/2013 13:18:00	2.7	2.2
12/12/2013 13:18:15	2.7	2.1
12/12/2013 13:18:30	2.7	2.1
12/12/2013 13:18:45	2.7	2.1
12/12/2013 13:19:00	2.7	2.1
12/12/2013 13:19:15	2.7	2.1

2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>	
12/12/2013 13:19:30	2.8	2.1	
12/12/2013 13:19:45	2.7	2.1	
12/12/2013 13:20:00	2.8	2.1	
12/12/2013 13:20:15	2.8	2.1	
12/12/2013 13:20:30	2.9	2.1	
12/12/2013 13:20:45	3.2	2.1	
12/12/2013 13:21:00	3.4	2.1	
12/12/2013 13:21:15	3.3	2.1	
12/12/2013 13:21:30	3.2	2.1	
12/12/2013 13:21:45	3.1	2.1	
12/12/2013 13:22:00	2.9	2.1	
12/12/2013 13:22:15	2.9	1.9	
12/12/2013 13:22:30	2.8	1.9	
12/12/2013 13:22:45	2.8	1.9	
12/12/2013 13:23:00	3.1	1.9	
12/12/2013 13:23:15	1.4	1.9	
12/12/2013 13:23:30	1.2	1.9	
12/12/2013 13:23:45	0.9	1.9	
12/12/2013 13:24:00	0.7	1.9	
12/12/2013 13:24:15	0.6	1.9	
12/12/2013 13:24:30	0.5	1.9	Calibration - Outlet THC
12/12/2013 13:24:45	0.4	1.9	Zero Air Injection
12/12/2013 13:25:00	0.4	1.9	0.3 ppm THC
12/12/2013 13:25:15	0.3	1.9	
12/12/2013 13:25:30	0.2	1.9	
12/12/2013 13:25:45	0.2	1.9	
12/12/2013 13:26:00	0.1	1.9	
12/12/2013 13:26:15	0.1	2.4	
12/12/2013 13:26:30	0.0	2.4	
12/12/2013 13:26:45	0.0	2.4	
12/12/2013 13:27:00	0.0	2.4	
12/12/2013 13:27:15	0.0	2.4	
12/12/2013 13:27:30	0.0	2.4	
12/12/2013 13:27:45	0.0	2.4	
12/12/2013 13:28:00	0.0	2.4	
12/12/2013 13:28:15	0.0	2.4	
12/12/2013 13:28:30	0.0	2.4	
12/12/2013 13:28:45	0.0	2.4	
12/12/2013 13:29:00	0.0	2.4	
12/12/2013 13:29:15	0.0	2.4	
12/12/2013 13:29:30	0.0	2.4	
12/12/2013 13:29:45	0.0	2.4	
12/12/2013 13:30:00	0.0	2.4	
12/12/2013 13:30:15	0.0	2.4	
12/12/2013 13:30:30	0.0	2.4	
12/12/2013 13:30:45	0.0	2.4	
12/12/2013 13:31:00	0.0	2.4	
12/12/2013 13:31:15	0.0	2.4	
12/12/2013 13:31:30	0.0	2.4	
12/12/2013 13:31:45	0.0	2.4	
12/12/2013 13:32:00	0.6	2.4	
12/12/2013 13:32:15	0.1	2.4	
12/12/2013 13:32:30	33.7	2.4	
12/12/2013 13:32:45	69.1	2.4	
12/12/2013 13:33:00	70.3	2.4	
12/12/2013 13:33:15	70.8	2.4	
12/12/2013 13:33:30	71.0	2.4	
12/12/2013 13:33:45	71.2	2.4	
12/12/2013 13:34:00	71.3	2.4	
12/12/2013 13:34:15	49.6	50.1	
12/12/2013 13:34:30	49.6	50.1	Calibration - Outlet THC
12/12/2013 13:34:45	49.8	50.1	50.0 ppm Injection
12/12/2013 13:35:00	49.9	50.1	49.9 ppm THC
12/12/2013 13:35:15	50.0	50.1	
12/12/2013 13:35:30	50.1	50.1	
12/12/2013 13:35:45	50.1	50.1	
12/12/2013 13:36:00	50.2	50.1	
12/12/2013 13:36:15	50.3	50.1	
12/12/2013 13:36:30	50.2	50.1	
12/12/2013 13:36:45	50.3	50.1	
12/12/2013 13:37:00	50.4	50.1	
12/12/2013 13:37:15	50.5	50.1	
12/12/2013 13:37:30	50.5	50.1	
12/12/2013 13:37:45	50.8	50.1	
12/12/2013 13:38:00	50.7	50.1	
12/12/2013 13:38:15	50.7	51.9	

2013 BP Whiting FCCU 500 NMOC Test

Span Units <u>Date / Time</u>	0-100 ppmv wb <u>Stack THC</u>	0-100 ppmv wb <u>Stack CH<sub>4</sub></u>	
12/12/2013 13:38:30	50.6	51.9	
12/12/2013 13:38:45	50.7	51.9	
12/12/2013 13:39:00	50.7	51.9	
12/12/2013 13:39:15	50.7	51.9	
12/12/2013 13:39:30	50.8	51.9	
12/12/2013 13:39:45	50.8	51.9	
12/12/2013 13:40:00	26.1	51.9	
12/12/2013 13:40:15	3.8	51.9	
12/12/2013 13:40:30	2.8	51.9	
12/12/2013 13:40:45	2.5	51.9	
12/12/2013 13:41:00	2.5	51.9	
12/12/2013 13:41:15	2.4	51.9	
12/12/2013 13:41:30	2.1	51.9	
12/12/2013 13:41:45	2.2	51.9	
12/12/2013 13:42:00	2.6	51.9	
12/12/2013 13:42:15	2.2	2.2	
12/12/2013 13:42:30	2.4	2.2	
12/12/2013 13:42:45	2.2	2.2	
12/12/2013 13:43:00	2.6	2.2	
12/12/2013 13:43:15	2.3	2.2	
12/12/2013 13:43:30	2.7	2.2	
12/12/2013 13:43:45	2.1	2.2	
12/12/2013 13:44:00	2.3	2.2	
12/12/2013 13:44:15	2.7	2.2	
12/12/2013 13:44:30	2.5	2.2	
12/12/2013 13:44:45	2.5	2.2	
12/12/2013 13:45:00	2.5	2.2	Start Run 3
12/12/2013 13:45:15	2.7	2.2	
12/12/2013 13:45:30	2.8	2.2	
12/12/2013 13:45:45	2.5	2.2	
12/12/2013 13:46:00	2.5	2.2	
12/12/2013 13:46:15	2.7	1.8	
12/12/2013 13:46:30	2.8	1.8	
12/12/2013 13:46:45	3.0	1.8	
12/12/2013 13:47:00	2.9	1.8	
12/12/2013 13:47:15	2.7	1.8	
12/12/2013 13:47:30	2.9	1.8	
12/12/2013 13:47:45	3.2	1.8	
12/12/2013 13:48:00	2.8	1.8	
12/12/2013 13:48:15	3.3	1.8	
12/12/2013 13:48:30	2.8	1.8	
12/12/2013 13:48:45	3.4	1.8	
12/12/2013 13:49:00	3.2	1.8	
12/12/2013 13:49:15	3.1	1.8	
12/12/2013 13:49:30	3.2	1.8	
12/12/2013 13:49:45	3.3	1.8	
12/12/2013 13:50:00	3.2	1.8	
12/12/2013 13:50:15	3.2	2.0	
12/12/2013 13:50:30	3.2	2.0	
12/12/2013 13:50:45	3.4	2.0	
12/12/2013 13:51:00	3.0	2.0	
12/12/2013 13:51:15	3.4	2.0	
12/12/2013 13:51:30	3.2	2.0	
12/12/2013 13:51:45	3.3	2.0	
12/12/2013 13:52:00	3.3	2.0	
12/12/2013 13:52:15	3.5	2.0	
12/12/2013 13:52:30	3.3	2.0	
12/12/2013 13:52:45	3.1	2.0	
12/12/2013 13:53:00	3.1	2.0	
12/12/2013 13:53:15	3.3	2.0	
12/12/2013 13:53:30	3.2	2.0	
12/12/2013 13:53:45	3.4	2.0	
12/12/2013 13:54:00	3.2	2.0	
12/12/2013 13:54:15	2.8	2.2	
12/12/2013 13:54:30	3.3	2.2	
12/12/2013 13:54:45	3.3	2.2	
12/12/2013 13:55:00	3.4	2.2	
12/12/2013 13:55:15	3.2	2.2	
12/12/2013 13:55:30	3.3	2.2	
12/12/2013 13:55:45	3.1	2.2	
12/12/2013 13:56:00	3.0	2.2	
12/12/2013 13:56:15	3.2	2.2	
12/12/2013 13:56:30	3.0	2.2	
12/12/2013 13:56:45	3.0	2.2	
12/12/2013 13:57:00	3.4	2.2	
12/12/2013 13:57:15	3.0	2.2	

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units <u>Date / Time</u>	0-100 ppmv wb <u>Stack THC</u>	0-100 ppmv wb <u>Stack CH<sub>4</sub></u>
12/12/2013 13:57:30	3.1	2.2
12/12/2013 13:57:45	3.2	2.2
12/12/2013 13:58:00	3.2	2.2
12/12/2013 13:58:15	2.9	2.1
12/12/2013 13:58:30	3.4	2.1
12/12/2013 13:58:45	3.3	2.1
12/12/2013 13:59:00	3.2	2.1
12/12/2013 13:59:15	3.3	2.1
12/12/2013 13:59:30	3.1	2.1
12/12/2013 13:59:45	3.5	2.1
12/12/2013 14:00:00	3.3	2.1
12/12/2013 14:00:15	3.2	2.1
12/12/2013 14:00:30	3.4	2.1
12/12/2013 14:00:45	3.2	2.1
12/12/2013 14:01:00	3.5	2.1
12/12/2013 14:01:15	4.3	2.1
12/12/2013 14:01:30	4.9	2.1
12/12/2013 14:01:45	4.7	2.1
12/12/2013 14:02:00	4.2	2.1
12/12/2013 14:02:15	4.0	2.4
12/12/2013 14:02:30	3.4	2.4
12/12/2013 14:02:45	3.8	2.4
12/12/2013 14:03:00	3.4	2.4
12/12/2013 14:03:15	3.7	2.4
12/12/2013 14:03:30	3.5	2.4
12/12/2013 14:03:45	3.5	2.4
12/12/2013 14:04:00	3.5	2.4
12/12/2013 14:04:15	3.6	2.4
12/12/2013 14:04:30	3.5	2.4
12/12/2013 14:04:45	3.2	2.4
12/12/2013 14:05:00	3.8	2.4
12/12/2013 14:05:15	3.4	2.4
12/12/2013 14:05:30	3.8	2.4
12/12/2013 14:05:45	3.2	2.4
12/12/2013 14:06:00	3.2	2.4
12/12/2013 14:06:15	3.4	2.5
12/12/2013 14:06:30	3.3	2.5
12/12/2013 14:06:45	3.4	2.5
12/12/2013 14:07:00	3.2	2.5
12/12/2013 14:07:15	4.7	2.5
12/12/2013 14:07:30	4.3	2.5
12/12/2013 14:07:45	3.9	2.5
12/12/2013 14:08:00	3.5	2.5
12/12/2013 14:08:15	3.4	2.5
12/12/2013 14:08:30	3.5	2.5
12/12/2013 14:08:45	3.5	2.5
12/12/2013 14:09:00	3.4	2.5
12/12/2013 14:09:15	3.3	2.5
12/12/2013 14:09:30	3.2	2.5
12/12/2013 14:09:45	3.3	2.5
12/12/2013 14:10:00	3.4	2.5
12/12/2013 14:10:15	3.5	2.3
12/12/2013 14:10:30	3.3	2.3
12/12/2013 14:10:45	3.2	2.3
12/12/2013 14:11:00	3.0	2.3
12/12/2013 14:11:15	3.4	2.3
12/12/2013 14:11:30	3.8	2.3
12/12/2013 14:11:45	3.2	2.3
12/12/2013 14:12:00	3.4	2.3
12/12/2013 14:12:15	3.5	2.3
12/12/2013 14:12:30	3.6	2.3
12/12/2013 14:12:45	3.5	2.3
12/12/2013 14:13:00	3.3	2.3
12/12/2013 14:13:15	3.2	2.3
12/12/2013 14:13:30	3.4	2.3
12/12/2013 14:13:45	3.4	2.3
12/12/2013 14:14:00	3.6	2.3
12/12/2013 14:14:15	3.0	2.4
12/12/2013 14:14:30	3.2	2.4
12/12/2013 14:14:45	3.1	2.4
12/12/2013 14:15:00	3.2	2.4
12/12/2013 14:15:15	3.3	2.4
12/12/2013 14:15:30	2.9	2.4
12/12/2013 14:15:45	3.1	2.4
12/12/2013 14:16:00	3.8	2.4
12/12/2013 14:16:15	3.4	2.4

## 2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 14:16:30	3.8	2.4
12/12/2013 14:16:45	3.0	2.4
12/12/2013 14:17:00	3.5	2.4
12/12/2013 14:17:15	3.1	2.4
12/12/2013 14:17:30	2.9	2.4
12/12/2013 14:17:45	3.3	2.4
12/12/2013 14:18:00	3.3	2.4
12/12/2013 14:18:15	3.1	2.8
12/12/2013 14:18:30	2.9	2.8
12/12/2013 14:18:45	2.8	2.8
12/12/2013 14:19:00	3.4	2.8
12/12/2013 14:19:15	3.2	2.8
12/12/2013 14:19:30	2.8	2.8
12/12/2013 14:19:45	2.8	2.8
12/12/2013 14:20:00	3.0	2.8
12/12/2013 14:20:15	3.1	2.8
12/12/2013 14:20:30	2.9	2.8
12/12/2013 14:20:45	2.9	2.8
12/12/2013 14:21:00	2.9	2.8
12/12/2013 14:21:15	2.8	2.8
12/12/2013 14:21:30	2.7	2.8
12/12/2013 14:21:45	3.1	2.8
12/12/2013 14:22:00	3.2	2.8
12/12/2013 14:22:15	2.8	2.5
12/12/2013 14:22:30	2.8	2.5
12/12/2013 14:22:45	2.8	2.5
12/12/2013 14:23:00	3.0	2.5
12/12/2013 14:23:15	2.8	2.5
12/12/2013 14:23:30	3.3	2.5
12/12/2013 14:23:45	2.8	2.5
12/12/2013 14:24:00	2.8	2.5
12/12/2013 14:24:15	3.0	2.5
12/12/2013 14:24:30	2.8	2.5
12/12/2013 14:24:45	2.9	2.5
12/12/2013 14:25:00	2.8	2.5
12/12/2013 14:25:15	2.9	2.5
12/12/2013 14:25:30	2.9	2.5
12/12/2013 14:25:45	2.9	2.5
12/12/2013 14:26:00	3.0	2.5
12/12/2013 14:26:15	2.7	2.7
12/12/2013 14:26:30	2.8	2.7
12/12/2013 14:26:45	3.1	2.7
12/12/2013 14:27:00	2.9	2.7
12/12/2013 14:27:15	2.8	2.7
12/12/2013 14:27:30	3.2	2.7
12/12/2013 14:27:45	2.8	2.7
12/12/2013 14:28:00	2.8	2.7
12/12/2013 14:28:15	2.9	2.7
12/12/2013 14:28:30	2.9	2.7
12/12/2013 14:28:45	2.8	2.7
12/12/2013 14:29:00	0.7	2.7
12/12/2013 14:29:15	0.0	2.7
12/12/2013 14:29:30	0.0	2.7
12/12/2013 14:29:45	0.0	2.7
12/12/2013 14:30:00	1.1	2.7
12/12/2013 14:30:15	0.0	2.7
12/12/2013 14:30:30	0.0	2.7
12/12/2013 14:30:45	0.7	2.7
12/12/2013 14:31:00	0.4	2.7
12/12/2013 14:31:15	0.4	2.7
12/12/2013 14:31:30	0.9	2.7
12/12/2013 14:31:45	0.4	2.7
12/12/2013 14:32:00	0.6	2.7
12/12/2013 14:32:15	0.2	2.7
12/12/2013 14:32:30	0.4	2.7
12/12/2013 14:32:45	0.4	2.7
12/12/2013 14:33:00	0.4	2.7
12/12/2013 14:33:15	2.4	2.7
12/12/2013 14:33:30	2.4	2.7
12/12/2013 14:33:45	0.4	2.7
12/12/2013 14:34:00	1.2	2.7
12/12/2013 14:34:15	2.6	2.7
12/12/2013 14:34:30	0.8	2.3
12/12/2013 14:34:45	0.0	2.0
12/12/2013 14:35:00	0.0	2.0
12/12/2013 14:35:15	2.8	2.0

Span Units Data / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 14:35:30	1.8	2.0
12/12/2013 14:35:45	2.4	2.0
12/12/2013 14:36:00	1.2	2.0
12/12/2013 14:36:15	1.5	2.0
12/12/2013 14:36:30	1.4	2.0
12/12/2013 14:36:45	1.5	2.0
12/12/2013 14:37:00	1.7	2.0
12/12/2013 14:37:15	1.3	2.0
12/12/2013 14:37:30	1.8	2.0
12/12/2013 14:37:45	1.9	2.0
12/12/2013 14:38:00	2.1	2.0
12/12/2013 14:38:15	3.1	2.0
12/12/2013 14:38:30	3.8	2.0
12/12/2013 14:38:45	3.4	2.0
12/12/2013 14:39:00	3.5	2.0
12/12/2013 14:39:15	3.2	2.0
12/12/2013 14:39:30	3.0	2.0
12/12/2013 14:39:45	2.8	2.0
12/12/2013 14:40:00	2.7	2.0
12/12/2013 14:40:15	2.9	2.0
12/12/2013 14:40:30	2.7	2.0
12/12/2013 14:40:45	2.5	2.0
12/12/2013 14:41:00	2.8	2.0
12/12/2013 14:41:15	2.8	2.0
12/12/2013 14:41:30	2.4	2.0
12/12/2013 14:41:45	2.5	2.0
12/12/2013 14:42:00	2.7	2.0
12/12/2013 14:42:15	2.8	2.0
12/12/2013 14:42:30	3.1	2.0
12/12/2013 14:42:45	3.4	2.0
12/12/2013 14:43:00	3.4	2.0
12/12/2013 14:43:15	3.3	2.0
12/12/2013 14:43:30	3.1	2.0
12/12/2013 14:43:45	3.5	2.0
12/12/2013 14:44:00	3.0	2.0
12/12/2013 14:44:15	2.5	2.0
12/12/2013 14:44:30	2.8	2.0
12/12/2013 14:44:45	2.7	2.0
12/12/2013 14:45:00	2.8	2.0
12/12/2013 14:45:15	2.7	2.0
12/12/2013 14:45:30	2.4	2.0
12/12/2013 14:45:45	2.1	2.0
12/12/2013 14:46:00	1.2	2.0
12/12/2013 14:46:15	1.3	0.6
12/12/2013 14:46:30	1.2	0.6
12/12/2013 14:46:45	1.2	0.6
12/12/2013 14:47:00	1.3	0.6
12/12/2013 14:47:15	1.2	0.6
12/12/2013 14:47:30	1.2	0.6
12/12/2013 14:47:45	1.2	0.6
12/12/2013 14:48:00	1.2	0.6
12/12/2013 14:48:15	3.0	0.5
12/12/2013 14:48:30	1.2	0.6
12/12/2013 14:48:45	0.5	0.6
12/12/2013 14:49:00	0.4	0.6
12/12/2013 14:49:15	0.4	0.6
12/12/2013 14:49:30	0.4	0.6
Calibration - Outlet THC		
12/12/2013 14:49:45	0.3	0.6
12/12/2013 14:50:00	0.3	0.6
12/12/2013 14:50:15	0.3	0.6
12/12/2013 14:50:30	0.3	0.6
Zero Air Injection 0.3 ppm THC		
12/12/2013 14:50:45	0.3	0.6
12/12/2013 14:51:00	0.2	0.6
12/12/2013 14:51:15	0.3	0.6
12/12/2013 14:51:30	0.2	0.6
12/12/2013 14:51:45	0.2	0.6
12/12/2013 14:52:00	0.2	0.6
12/12/2013 14:52:15	0.3	0.6
12/12/2013 14:52:30	0.2	0.6
12/12/2013 14:52:45	0.2	0.6
12/12/2013 14:53:00	0.2	0.6
12/12/2013 14:53:15	0.2	0.6
12/12/2013 14:53:30	0.2	0.6
12/12/2013 14:53:45	0.2	0.6
12/12/2013 14:54:00	0.2	0.6
12/12/2013 14:54:15	0.2	0.6
Post Calibration - Methane		
Zero Air Injection 0.6 ppm CH <sub>4</sub>		
12/12/2013 14:54:30	0.6	0.6
12/12/2013 14:54:45	0.6	0.6
12/12/2013 14:55:00	0.6	0.6
12/12/2013 14:55:15	0.6	0.6
12/12/2013 14:55:30	0.6	0.6
12/12/2013 14:55:45	0.6	0.6
12/12/2013 14:56:00	0.6	0.6
12/12/2013 14:56:15	0.6	0.6
12/12/2013 14:56:30	0.6	0.6
12/12/2013 14:56:45	0.6	0.6
12/12/2013 14:57:00	0.6	0.6
12/12/2013 14:57:15	0.6	0.6
12/12/2013 14:57:30	0.6	0.6
12/12/2013 14:57:45	0.6	0.6
12/12/2013 14:58:00	0.6	0.6
12/12/2013 14:58:15	0.6	0.6
12/12/2013 14:58:30	0.6	0.6
12/12/2013 14:58:45	0.6	0.6
12/12/2013 14:59:00	0.6	0.6
12/12/2013 14:59:15	0.6	0.6
12/12/2013 14:59:30	0.6	0.6
12/12/2013 14:59:45	0.6	0.6
12/12/2013 15:00:00	0.6	0.6
12/12/2013 15:00:15	0.6	0.6
12/12/2013 15:00:30	0.6	0.6
12/12/2013 15:00:45	0.6	0.6
12/12/2013 15:01:00	0.6	0.6
12/12/2013 15:01:15	0.6	0.6
12/12/2013 15:01:30	0.6	0.6
12/12/2013 15:01:45	0.6	0.6
12/12/2013 15:02:00	0.6	0.6
12/12/2013 15:02:15	0.6	0.6
12/12/2013 15:02:30	0.6	0.6
12/12/2013 15:02:45	0.6	0.6
12/12/2013 15:03:00	0.6	0.6
12/12/2013 15:03:15	0.6	0.6
12/12/2013 15:03:30	0.6	0.6
12/12/2013 15:03:45	0.6	0.6
12/12/2013 15:04:00	0.6	0.6
12/12/2013 15:04:15	0.6	0.6
Post Calibration - Methane		

2013 BP Whiting FCCU 500 NMOC Test

Span Units Date / Time	0-100 ppmv wb Stack THC	0-100 ppmv wb Stack CH <sub>4</sub>
12/12/2013 14:54:30	0.2	0.6
12/12/2013 14:54:45	0.2	0.6
12/12/2013 14:55:00	0.2	0.6
12/12/2013 14:55:15	0.2	0.6
12/12/2013 14:55:30	0.2	0.6
12/12/2013 14:55:45	0.2	0.6
12/12/2013 14:56:00	0.1	0.6
12/12/2013 14:56:15	0.2	0.6
12/12/2013 14:56:30	0.2	0.6
12/12/2013 14:56:45	0.2	0.6
12/12/2013 14:57:00	0.1	0.6
12/12/2013 14:57:15	0.2	0.6
12/12/2013 14:57:30	0.2	0.6
12/12/2013 14:57:45	0.2	0.6
12/12/2013 14:58:00	0.2	0.6
12/12/2013 14:58:15	0.2	0.6
12/12/2013 14:58:30	0.2	0.6
12/12/2013 14:58:45	0.1	0.6
12/12/2013 14:59:00	0.1	0.6
12/12/2013 14:59:15	0.1	0.6
12/12/2013 14:59:30	0.2	0.6
12/12/2013 14:59:45	0.1	0.6
12/12/2013 15:00:00	13.1	0.6
12/12/2013 15:00:15	38.0	0.6
12/12/2013 15:00:30	47.8	8.1
12/12/2013 15:00:45	46.4	18.6
12/12/2013 15:01:00	46.6	49.9
12/12/2013 15:01:15	48.4	50.0
12/12/2013 15:01:30	48.3	50.0
12/12/2013 15:01:45	48.2	50.0
12/12/2013 15:02:00	48.1	50.0
12/12/2013 15:02:15	48.2	50.0
12/12/2013 15:02:30	48.2	50.0
12/12/2013 15:02:45	48.2	50.0
12/12/2013 15:03:00	48.2	50.0
12/12/2013 15:03:15	48.2	50.0
12/12/2013 15:03:30	48.2	50.0
12/12/2013 15:03:45	48.3	50.1
12/12/2013 15:04:00	48.3	50.4
12/12/2013 15:04:15	48.4	50.4
12/12/2013 15:04:30	48.4	50.4
12/12/2013 15:04:45	48.4	50.4
12/12/2013 15:05:00	48.4	50.4
12/12/2013 15:05:15	48.3	50.4
12/12/2013 15:05:30	48.3	50.4
12/12/2013 15:05:45	48.3	50.4
12/12/2013 15:06:00	48.4	50.4
12/12/2013 15:06:15	48.3	50.4
12/12/2013 15:06:30	48.4	50.4
12/12/2013 15:06:45	48.4	50.4
12/12/2013 15:07:00	48.5	50.5
12/12/2013 15:07:15	48.5	50.5
12/12/2013 15:07:30	48.5	50.5
12/12/2013 15:07:45	48.5	50.5
12/12/2013 15:08:00	48.6	50.5
12/12/2013 15:08:15	48.9	50.5
12/12/2013 15:08:30	48.9	50.5
12/12/2013 15:08:45	48.9	50.5
12/12/2013 15:09:00	48.9	50.5
12/12/2013 15:09:15	48.9	50.5
12/12/2013 15:09:30	49.0	50.5
12/12/2013 15:09:45	48.9	50.5
12/12/2013 15:10:00	48.9	50.8
12/12/2013 15:10:15	48.9	50.8
12/12/2013 15:10:30	48.8	50.8
12/12/2013 15:10:45	48.9	50.8
12/12/2013 15:11:00	48.8	50.8
12/12/2013 15:11:15	48.9	50.8
12/12/2013 15:11:30	48.9	50.8
12/12/2013 15:11:45	49.0	50.8
12/12/2013 15:12:00	49.0	50.8

Zero Air Injection  
0.6 ppm CH<sub>4</sub>

Post Calibration - Methane

Zero Air Injection  
0.6 ppm CH<sub>4</sub>

Post Calibration - Zero Methane  
Average ppm CH<sub>4</sub> = 0.6

Calibration - Outlet THC

50 ppm Injection  
48.2 ppm THC

Post Calibration - Methane

50.0 ppm Injection  
50.4 ppm CH<sub>4</sub>

Post Calibration - Methane

50.0 ppm Injection  
50.4 ppm CH<sub>4</sub>

Post Calibration - Methane

50.0 ppm Injection  
50.8 ppm CH<sub>4</sub>

Post Calibration - 50.0 ppm Methane  
Average ppm CH<sub>4</sub> = 50.5



BP Whiting Refinery: Whiting, IN  
FCCU 500  
Test Date: 12/12/13

## APPENDIX D

## Calibration Data

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## CEM Calibration Data Sheet

### Analyzer Response

Plant Name:	BP	<b>ANALYZER SPAN VALUE (% or ppm)</b>
Sampling Location:	FCCU 500 Exhaust	
Date:	12/12/2013	VOC Stack: 100
Plant Rep.:	Brandon Milk	CH <sub>4</sub> Stack: 100
Team Leader:	Steve Flaherty	
CEM Operator:	Steve Flaherty	
Time:	Pretest Cals	

	CYLINDER No. and Concentration	CYLINDER VALUE (% or ppm)	ANALYZER CALIBRATION RESPONSE	DIFFERENCE (% OF GAS)
VOC Stack Zero	AAL-14768: Zero Air	0.0	0.1	0.05
VOC Stack Low	ALM-005994: 84.0 ppm	25.0	25.2	0.84
VOC Stack Mid	ALM-005994: 84.0 ppm	50.0	50.2	0.38
VOC Stack High	ALM-005994: 84.0 ppm	84.0	84.8	0.94

#### Methane analyzer initial calibrations (average of three injections).

CH <sub>4</sub> Stack Zero	AAL-14768: Zero Air	0.0	0.5	0.47
CH <sub>4</sub> Stack Low	ALM-005994: 84.0 ppm	25.0	24.9	-0.54
CH <sub>4</sub> Stack Mid	ALM-005994: 84.0 ppm	50.0	50.3	0.61
CH <sub>4</sub> Stack High	ALM-005994: 84.0 ppm	84.0	85.0	1.15

#### Methane analyzer post calibration verification (average of three injections).

CH <sub>4</sub> Zero Gas	AAL-14768: Zero Air	0.0	0.6	0.56
CH <sub>4</sub> Mid Level	ALM-005994: 84.0 ppm	50.0	50.5	1.03

# REFERENCE METHOD CALIBRATION DATA

## Bias and Drift

**Plant Name:** BP **Analyzer Span Value (% or ppm)**  
**Sampling Location:** FCCU 500 Exhaust **VOC Stack** 100 ppmv  
**CEM Operator:** Steve Flaherty  
**Plant Representative:** Brandon Milk  
**Project Manager:** Steve Flaherty

Run:		1		2		3	
Date:		12/12/13		12/12/13		12/12/13	
Time:		10:45-11:45		12:10-13:10		13:45-14:45	
VOCstack	Zero, ppm	Pretest	Posttest	Drift	Pretest	Posttest	Drift
		0.1	0.1	0.0	0.1	0.3	0.0
	Zero Drift, % of Span	0.1	0.1	0.0	0.1	0.3	0.0
	Cylinder Conc., ppm	50.0	50.0		50.0	50.0	
	System Response, ppm	50.2	49.6	-0.6	49.6	49.9	-1.7
	Cal Drift, % of Span	0.2	-0.4	-0.6	-0.4	-0.1	-1.7

# PRECISION OF METHANE CALIBRATIONS



Company: BP  
 Location: Whiting, IN  
 Source: FCCU 500 Exhaust  
 Date: 12/12/2013  
 Analyzer Span: 100 ppm

Calibration	Injection No.	Date	Methane Calibration Time	Calibration Response (ppm)	Deviation from Mean (%)	Deviation within 5% of average?
Pre Test - 0.0 ppmv	1	12/12/2013	9:33	0.4	NA	
Pre Test - 0.0 ppmv	2	12/12/2013	9:36	0.6	NA	
Pre Test - 0.0 ppmv	3	12/12/2013	9:39	0.5	NA	
Mean conc., ppmv				0.5		
Pre Test - 25.0 ppmv	1	12/12/2013	10:13	25.1	1.1	yes
Pre Test - 25.0 ppmv	2	12/12/2013	10:16	24.8	-0.1	yes
Pre Test - 25.0 ppmv	3	12/12/2013	10:19	24.6	-0.9	yes
Mean conc., ppmv				24.9		
Pre Test - 50.0 ppmv	1	12/12/2013	9:46	50.0	-0.7	yes
Pre Test - 50.0 ppmv	2	12/12/2013	9:49	50.5	0.4	yes
Pre Test - 50.0 ppmv	3	12/12/2013	9:52	50.4	0.2	yes
Mean conc., ppmv				50.3		
Pre Test - 84.0 ppmv	1	12/12/2013	10:01	84.9	0.0	yes
Pre Test - 84.0 ppmv	2	12/12/2013	10:04	85.1	0.2	yes
Pre Test - 84.0 ppmv	3	12/12/2013	10:07	84.8	-0.2	yes
Mean conc., ppmv				85.0		
Post Test - 0.0 ppmv	1	12/12/2013	14:51	0.6	NA	
Post Test - 0.0 ppmv	2	12/12/2013	14:54	0.6	NA	
Post Test - 0.0 ppmv	3	12/12/2013	14:58	0.6	NA	
Mean conc., ppmv				0.6		
Post Test - 50.0 ppmv	1	12/12/2013	15:03	50.4	0.3	yes
Post Test - 50.0 ppmv	2	12/12/2013	15:06	50.4	0.2	yes
Post Test - 50.0 ppmv	3	12/12/2013	15:09	50.8	-0.5	yes
Mean conc., ppmv				50.5		
Pre/Post Average (must be < 5% from the mean of the pre/post mid level values)					-0.2	yes

**ARI REFERENCE METHOD CEMS DATA  
USEPA METHOD 205  
DILUTION SYSTEM VERIFICATION**

**Company:** BP  
**Location:** Whiting, IN  
**Dilution System ID:** 4743  
**Dilution Flow Rate:** 5.0 Lpm  
**Verification date:** 12/11/2013

**Analyzer Info**  
**Monitor type:** Servomex 1440  
**Monitor range:** 20%  
**Monitor Serial No.:** 01440D1/3807

**Initial Calibration Data**

<u>Calibration Concentration</u>	<u>Calibration results</u>	<u>% Difference</u>
Zero: 0.00	Zero: 0.01	Zero: 0.04
Mid: 10.00	Mid: 10.06	Mid: 0.28
High: 20.00	High: 20.03	High: 0.16

**Dilution System Verification**

Mid level gas type: <u>USEPA Protocol 1</u>	High level dilution gas type: <u>USEPA Protocol 1</u>
Mid level concentration: <u>12.60</u>	High level concentration: <u>22.6</u>
Mid level tank serial #: <u>AAL-13543</u>	High level tank serial #: <u>ALM-059370</u>
	Target concentration No. 1: <u>5.00</u>
	Target concentration No. 2: <u>12.60</u>

**Dilution System Results**

<u>Target Concentration No. 1</u>			<u>Target Concentration No. 2</u>		
<u>Instrument Response</u>	<u>% difference from average*</u>		<u>Instrument Response</u>	<u>% difference from average*</u>	
Trial No. 1: 5.04	0.49		Trial No. 1: 12.55	0.06	
Trial No. 2: 5.01	0.16		Trial No. 2: 12.54	0.02	
Trial No. 3: 5.00	0.33		Trial No. 3: 12.53	0.09	
Average: 5.016			Average: 12.539		

% Difference from target concentration: 0.32%    % Difference from target concentration: 0.48%

**Mid Level Calibration Gas Results**

<u>Instrument Response</u>	
Trial No. 1: 12.52	Mid Level calibration gas concentration: <u>12.60</u>
Trial No. 2: 12.52	Average analyzer response: <u>12.521</u>
Trial No. 3: 12.52	Percent difference: <u>0.63</u> *

\* Must be less than 2 %

# USEPA METHOD 205

## Dilution System Verification

Scale Date, Time	0-20% Oxygen	
12/11/2013 10:12:00	0.04	
12/11/2013 10:12:15	-0.02	
12/11/2013 10:12:30	0.01	<b>Initial Calibration</b>
12/11/2013 10:12:45	<b>0.01</b>	Zero Nitrogen Injection
12/11/2013 10:13:00	<b>0.01</b>	<b>0.01 % Oxygen</b>
12/11/2013 10:13:15	<b>0.00</b>	
12/11/2013 10:13:30	<b>0.00</b>	
12/11/2013 10:13:45	-0.04	
12/11/2013 10:14:00	-0.05	
12/11/2013 10:14:15	-0.03	
12/11/2013 10:14:30	0.39	
12/11/2013 10:14:45	11.42	
12/11/2013 10:15:00	19.75	
12/11/2013 10:15:15	19.96	
12/11/2013 10:15:30	20.01	<b>Initial Calibration</b>
12/11/2013 10:15:45	<b>20.02</b>	20.0% Oxygen Injection
12/11/2013 10:16:00	<b>20.03</b>	<b>20.03 % Oxygen</b>
12/11/2013 10:16:15	<b>20.03</b>	
12/11/2013 10:16:30	<b>20.04</b>	
12/11/2013 10:16:45	16.95	
12/11/2013 10:17:00	11.65	
12/11/2013 10:17:15	10.05	
12/11/2013 10:17:30	10.05	
12/11/2013 10:17:45	10.05	<b>Initial Calibration</b>
12/11/2013 10:18:00	<b>10.05</b>	10.0% Oxygen Injection
12/11/2013 10:18:15	<b>10.05</b>	<b>10.06 % Oxygen</b>
12/11/2013 10:18:30	<b>10.05</b>	
12/11/2013 10:18:45	<b>10.06</b>	
12/11/2013 10:19:00	8.85	
12/11/2013 10:19:15	5.87	
12/11/2013 10:19:30	5.05	
12/11/2013 10:19:45	5.04	
12/11/2013 10:20:00	5.04	<b>Target 1: Trial 1</b>
12/11/2013 10:20:15	<b>5.04</b>	5.0% Oxygen Injection
12/11/2013 10:20:30	<b>5.04</b>	<b>5.04 % Oxygen</b>
12/11/2013 10:20:45	<b>5.04</b>	
12/11/2013 10:21:00	<b>5.04</b>	
12/11/2013 10:21:15	7.18	
12/11/2013 10:21:30	12.69	
12/11/2013 10:21:45	12.56	
12/11/2013 10:22:00	12.55	<b>Target 2: Trial 1</b>
12/11/2013 10:22:15	<b>12.55</b>	12.6% Oxygen Injection
12/11/2013 10:22:30	<b>12.55</b>	<b>12.55 % Oxygen</b>
12/11/2013 10:22:45	<b>12.55</b>	
12/11/2013 10:23:00	<b>12.54</b>	
12/11/2013 10:23:15	12.54	
12/11/2013 10:23:30	12.55	
12/11/2013 10:23:45	13.12	
12/11/2013 10:24:00	12.51	
12/11/2013 10:24:15	12.51	
12/11/2013 10:24:30	12.51	
12/11/2013 10:24:45	12.51	
12/11/2013 10:25:00	12.51	<b>Accuracy 1</b>
12/11/2013 10:25:15	<b>12.51</b>	Cylinder No. AAL-13543
12/11/2013 10:25:30	<b>12.52</b>	Cylinder Conc. 12.6%
12/11/2013 10:25:45	<b>12.52</b>	<b>12.52 % Oxygen</b>
12/11/2013 10:26:00	<b>12.52</b>	
12/11/2013 10:26:15	12.52	
12/11/2013 10:26:30	6.81	
12/11/2013 10:26:45	0.97	
12/11/2013 10:27:00	5.03	
12/11/2013 10:27:15	4.98	<b>Target 1: Trial 2</b>
12/11/2013 10:27:30	<b>5.00</b>	5.0% Oxygen Injection
12/11/2013 10:27:45	<b>5.00</b>	<b>5.01 % Oxygen</b>
12/11/2013 10:28:00	<b>5.01</b>	
12/11/2013 10:28:15	<b>5.02</b>	
12/11/2013 10:28:30	5.02	
12/11/2013 10:28:45	11.44	

# USEPA METHOD 205 Dilution System Verification

12/11/2013 10:29:00	12.60	
12/11/2013 10:29:15	12.56	<b>Target 2: Trial 2</b>
12/11/2013 10:29:30	<b>12.55</b>	12.6% Oxygen Injection
12/11/2013 10:29:45	<b>12.54</b>	12.54 % Oxygen
12/11/2013 10:30:00	<b>12.54</b>	
12/11/2013 10:30:15	<b>12.54</b>	
12/11/2013 10:30:30	12.53	
12/11/2013 10:30:45	12.69	
12/11/2013 10:31:00	12.50	
12/11/2013 10:31:15	12.52	<b>Accuracy 2</b>
12/11/2013 10:31:30	<b>12.52</b>	Cylinder No. AAL-13543
12/11/2013 10:31:45	<b>12.52</b>	Cylinder Conc. 12.6%
12/11/2013 10:32:00	<b>12.52</b>	12.52 % Oxygen
12/11/2013 10:32:15	<b>12.52</b>	
12/11/2013 10:32:30	12.52	
12/11/2013 10:32:45	2.65	
12/11/2013 10:33:00	2.02	
12/11/2013 10:33:15	5.01	
12/11/2013 10:33:30	4.98	<b>Target 1: Trial 3</b>
12/11/2013 10:33:45	<b>4.99</b>	5.0% Oxygen Injection
12/11/2013 10:34:00	<b>5.00</b>	5.00 % Oxygen
12/11/2013 10:34:15	<b>5.01</b>	
12/11/2013 10:34:30	<b>5.00</b>	
12/11/2013 10:34:45	5.04	
12/11/2013 10:35:00	11.42	
12/11/2013 10:35:15	12.51	
12/11/2013 10:35:30	12.54	
12/11/2013 10:35:45	12.53	<b>Target 2: Trial 3</b>
12/11/2013 10:36:00	<b>12.53</b>	12.6% Oxygen Injection
12/11/2013 10:36:15	<b>12.53</b>	12.53 % Oxygen
12/11/2013 10:36:30	<b>12.53</b>	
12/11/2013 10:36:45	<b>12.53</b>	
12/11/2013 10:37:00	12.52	
12/11/2013 10:37:15	12.52	
12/11/2013 10:37:30	12.71	
12/11/2013 10:37:45	12.51	
12/11/2013 10:38:00	12.52	
12/11/2013 10:38:15	12.53	<b>Accuracy 3</b>
12/11/2013 10:38:30	<b>12.52</b>	Cylinder No. AAL-13543
12/11/2013 10:38:45	<b>12.53</b>	Cylinder Conc. 12.6%
12/11/2013 10:39:00	<b>12.53</b>	12.52 % Oxygen
12/11/2013 10:39:15	<b>12.52</b>	
12/11/2013 10:39:30	12.52	



Air Liquide America  
Specialty Gases LLC



Shipped 1290 COMBERMERE STREET  
From: TROY MI 48083  
Phone: 248-589-2950

Fax: 248-589-2134

C E R T I F I C A T E O F A N A L Y S I S

ARI ENVIRONMENTAL, INC

DOCUMENT#: 50432847 -002

951 OLD RAND ROAD #106  
WAUCONDA IL 60084  
US

PO#: ARI STOCK  
ITEM #: 363-30AL  
DATE: 26Apr2013

CYLINDER #: AAL14768  
FILL PRESSURE: 02000 PSIG

PRODUCT EXPIRATION: 26Apr2016

PURE MATERIAL: AIR

CAS# 132259-10-0

GRADE: ZERO

<u>IMPURITY</u>	<u>MAXIMUM CONCENTRATIONS</u>	<u>ACTUAL CONCENTRATIONS</u>
THC	1 PPM	< 1 PPM
O2	20 TO 21%	20.3%

QC BATCH: AIR041013

LOT # : TRO0081310

ANALYST: SH

SAJAD HYDER

**AIR LIQUIDE**Air Liquide America  
Specialty Gases LLCScott<sup>™</sup>**RATA CLASS***Guaranteed +/- 1% Accuracy*

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950

Fax: 248-589-2134

**CERTIFICATE OF ACCURACY: EPA Protocol Gas****Assay Laboratory - PGVP Vendor ID: A22013**AIR LIQUIDE AMERICA SPECIALTY GASES LLC  
1290 COMBERMERE STREET  
TROY, MI 48083

P.O. No.: IL-364-13

Document #: 52890274-001

Folio #: 85 ppm Methane/air

**Customer**ARI ENVIRONMENTAL, INC.  
951 OLD RAND ROAD #106  
WAUCONDA IL 60084  
US**ANALYTICAL INFORMATION Gas Type : CH<sub>4</sub>, BALA**

This certification was performed according to EPA Traceability Protocol For Assay &amp; Certification of Gaseous Calibration Standards; Procedure G-1. EPA/600/R-12/531; May 2012. Do not use this standard if pressure is less than 100 psig.

**Cylinder Number:** ALM005994  
**Cylinder Pressure:** 1950 PSIG**Certification Date:** 05Nov2013**Exp. Date:** 06Nov2021  
**Batch No:** TRO0096053**COMPONENT**METHANE  
AIR**CERTIFIED CONCENTRATION (Moles)**84.0 PPM  
BALANCE**ACCURACY (ABSOLUTE / RELATIVE)**

0.5 PPM / 0.6 %

**TRACEABILITY****REFERENCE STANDARD****COMPONENT**

METHANE

**CONCENTRATION**

100.2000 PPM

**UNCERTAINTY**

0.6000 %

**CYLINDER**

K016215

**TYPE/SRM SAMPLE**

NTRM 2751

**EXP. DATE**

30Apr2016

**ANALYTICAL METHOD****1st Analysis:** 05Nov2013**COMPONENT**

METHANE

**INSTRUMENT**

VARIAN/3400/7506

**ANALYTICAL/PRINCIPLE**

TCD/FID

**CALIBRATED**

22Oct2013

**CONCENTRATION**

84.00 PPM

APPROVED BY:

D-8

ROBERT LESNIAK



Air Liquide America  
Specialty Gases LLC



# RATA CLASS

## Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950

Fax: 248-589-2134

### CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A22012

P.O. No.: IL-255-12

Customer

ARI ENVIRONMENTAL, INC.

AIR LIQUIDE AMERICA SPECIALTY GASES LLC Document #: 46358030-004  
1290 COMBERMERE STREET  
TROY, MI 48083

951 OLD RAND ROAD #106  
WAUCONDA IL 60084  
US

#### ANALYTICAL INFORMATION Gas Type : O<sub>2</sub>

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards;  
Procedure G-1; September, 1997.

Cylinder Number: AAL13543  
Cylinder Pressure\*\*\*: 2000 PSIG

Certification Date: 11Jun2012

Exp. Date: 11Jun2015  
Batch No: TRO0060089

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
OXYGEN	12.6 %	+/- 1%	Direct NIST and VSL
NITROGEN	BALANCE		

\*\*\* Do not use when cylinder pressure is below 150 psig.

\*\* Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

#### REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2350 23	04Jan2018	K024582	23.20 %	OXYGEN

#### INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
Y110P/V03018	08Jun2012	PARAMAGNETIC

#### ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

##### First Triad Analysis

##### Second Triad Analysis

##### Calibration Curve

#### OXYGEN

Date: 12Jun2012 Response Unit: %  
Z1=0.00000 R1=23.20000 T1=12.59000  
R2=23.20000 Z2=0.00000 T2=12.59000  
Z3=0.00000 T3=12.59000 R3=23.20000  
Avg. Concentration: 12.58 %

Concentration = A + Bx + Cx<sup>2</sup> + Dx<sup>3</sup> + Ex<sup>4</sup>  
r = 0.999999  
Constants: A = -0.0139558  
B = 1.000315091 C = 0  
D = 0 E = 0

Special Notes:

DELIVERY DOO# IS 46357971

APPROVED BY:

JEFF CHOREAU



Air Liquide America  
Specialty Gases LLC



# RATA CLASS

## Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950

Fax: 248-589-2134

### CERTIFICATE OF ACCURACY: EPA Protocol Gas

#### Assay Laboratory - PGVP Vendor ID: A22013

AIR LIQUIDE AMERICA SPECIALTY GASES LLC  
1290 COMBERMERE STREET  
TROY, MI 48083

P.O. No.: ARI STOCK  
Document #: 50857103-001  
Folio #: 22.5% CO<sub>2</sub>/O<sub>2</sub>/N<sub>2</sub>

#### Customer

ARI ENVIRONMENTAL, INC

951 OLD RAND ROAD #106  
WAUCONDA IL 60084  
US

#### ANALYTICAL INFORMATION Gas Type : CO<sub>2</sub>,O<sub>2</sub>,BALN

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards;  
Procedure G-1; September, 1997.

Cylinder Number: ALM059370  
Cylinder Pressure\*\*\*: 2000 PSIG

Certification Date: 11Jun2013

Exp. Date: 12Jun2021  
Batch No: TRO0084950

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	22.4 %	+/- 1 %	Direct NIST and VSL
OXYGEN	22.6 %	+/- 1 %	Direct NIST and VSL
NITROGEN	BALANCE		

\*\*\* Do not use when cylinder pressure is below 150 psig.

\*\* Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

#### REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	17Aug2016	K026052	23.04 %	CARBON DIOXIDE
NTRM 2350 23	04Jan2018	K024582	23.20 %	OXYGEN

#### INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	28May2013	NDIR
CAI/110P/V03018	03Jun2013	PARAMAGNETIC

#### ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

##### First Triad Analysis

##### Second Triad Analysis

##### Calibration Curve

#### CARBON DIOXIDE

Date: 11Jun2013 Response Unit: MV  
Z1=0.00000 R1=94.20000 T1=92.80000  
R2=94.20000 Z2=0.00000 T2=92.80000  
Z3=0.00000 T3=92.80000 R3=94.20000  
Avg. Concentration: 22.39 PPM

Concentration = A + Bx + Cx<sup>2</sup> + Dx<sup>3</sup> + Ex<sup>4</sup>  
r = 0.999998  
Constants: A = -0.00478797  
B = 0.127855111 C = 8.006E-05  
D = 0.000011465 E = 0

#### OXYGEN

Date: 11Jun2013 Response Unit: %  
Z1=0.00000 R1=23.20000 T1=22.63000  
R2=23.20000 Z2=0.00000 T2=22.63000  
Z3=0.00000 T3=22.63000 R3=23.20000  
Avg. Concentration: 22.62 %

Concentration = A + Bx + Cx<sup>2</sup> + Dx<sup>3</sup> + Ex<sup>4</sup>  
r = 0.999999  
Constants: A = -0.01175669  
B = 1.000226328 C = 0  
D = 0 E = 0

APPROVED BY:

D-10

JEFF CROTEAU

ARI ENVIRONMENTAL, INC.  
Pretest Meter Calibration Data

Model #: Apex Instruments M4 Console  
Serial #: 911008  
Date: 2/19/2013  
Barometric Pressure, in. Hg: 29.26  
Secondary Std. Model: Bios VL-90d  
Secondary Standard SN: 114556

DRY GAS METER DATA					SECONDARY STANDARD TEST METER DATA						
$\Delta H$ (in. H <sub>2</sub> O)	Time (min)	Volume		Total (Liters)	Temperature T <sub>in</sub> T <sub>out</sub>		Average Flow		Temperature T <sub>in</sub> T <sub>out</sub>		Inlet (°F)
		Initial (liters)	Final (liters)		Initial (°F)	Outlet (°F)	Static Pressure (in. Water)	Period (liters/min)	Volume Total (liters)	Initial (°F)	Outlet (°F)
0.00	10.0	0.00	229.51	229.510	Initial > 63	93	-5.35	22.779	227.790	Initial > 77	77
			Final > 95		95	95				Final > 77	77
1.75	10.0	0.00	212.39	212.390	Initial > 65	65	-5.35	21.126	211.260	Initial > 77	77
			Final > 96		96	96				Final > 78	78
1.50	10.0	0.00	221.27	221.270	Initial > 97	97	-6.43	19.652	216.172	Initial > 78	78
			Final > 97		97	97				Final > 78	78
1.25	10.0	0.00	161.45	161.450	Initial > 97	97	-4.62	17.393	178.830	Initial > 79	79
			Final > 97		97	97				Final > 78	78
1.00	10.0	0.00	163.47	163.470	Initial > 97	97	-4.28	16.143	161.430	Initial > 79	79
			Final > 97		97	97				Final > 79	79

DRY GAS METER PRETEST CALIBRATION RESULTS				
DRY GAS METER		CALIBRATION		
VOLUME (Liters)	SECONDARY STANDARD VOLUME (Liters)	FACTOR, Y <sub>d</sub> (dimensionless)	Deviation (%)	
214.989	216.087	1.0051	-0.234	
196.758	200.220	1.0074	-0.458	
205.896	204.122	0.9914	1.135	
168.737	169.241	1.0030	-0.022	
151.922	152.984	1.0070	-0.422	
AVERAGE PRETEST METER CALIBRATION FACTOR, Y <sub>d</sub> = 1.003				

CALIBRATION METER WORKBOOK 2013

Signature: W. Davis Date: 2-19-13

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Pre-Test



Meter Box: 811008

Calibrator: B. Crane

Date: 2/19/2013

Barometric: 29.26

Ambient Temp 78

Reference Thermometer: Altek Thermocouple Source

CAL-SK25/M4METER-WORKBOOK-204T

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		1	0.22	1	0.22
100			99	-0.18	100	0.00
200			202	0.30	202	0.30
300			301	0.13	302	0.26
400			398	-0.23	399	-0.12
500			499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	2	0.43	1	0.22	1	0.22
100	100	0.00	99	-0.18	99	-0.18
200	202	0.30	202	0.30	202	0.30
300	302	0.26	301	0.13	301	0.13
400	399	-0.12	398	-0.23	398	-0.23
500	499	-0.10	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	2	0.43
200	203	0.45
400	399	-0.12
600	602	0.19
800	803	0.24
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1399	-0.05
1600	1602	0.10
1800	1800	0.00

Revised 10/03

### Post Test Meter Calibration Data

<b>Model #:</b> Apex Instruments M4 Console	<b>Barometric Pressure, in. Hg:</b> 29.43	<b>Pretest Meter <math>Y_d</math> =</b> 1.003
<b>Serial #:</b> 811008	<b>Secondary Std. Model:</b> Bios ML-800	<b>Date of Pretest =</b> 2/19/13
<b>Date:</b> 12/16/2013	<b>Secondary Standard SN:</b> 114556	

SECONDARY STANDARD TEST METER DATA											
DRY GAS METER DATA					AVERAGE FLOW						
$\Delta H$ (in. H <sub>2</sub> O)	Time (min)	Volume		Total (Liters)	Temperature		Static Pressure (in. Water)	Period (liters/min)	Volume		
		Initial (liters)	Final (liters)		T <sub>mi</sub> Inlet (°F)	T <sub>mo</sub> Outlet (°F)				Inlet (°F)	Outlet (°F)
2.00	11.0	0.00	244.94	244.94	Initial > 74	74	-13.65	23.245	255.695	Initial > 72	72
					Final > 81	81				Final > 73	73
2.00	10.0	0.00	224.72	224.72	Initial > 81	81	-13.65	23.115	231.150	Initial > 73	73
					Final > 86	86				Final > 73	73
2.00	10.0	0.00	226.03	226.03	Initial > 86	86	-13.65	23.371	233.710	Initial > 73	73
					Final > 90	90				Final > 74	74

DRY GAS METER POST TEST CALIBRATION RESULTS				
DRY GAS METER VOLUME (Liters)	SECONDARY STANDARD VOLUME (Liters)	CALIBRATION FACTOR, $Y_d$ (dimensionless)	Deviation (%)	
237.85	240.877	1.0127	0.112	
215.81	217.550	1.0081	0.571	
215.28	219.754	1.0208	-0.683	
AVERAGE POST TEST METER CALIBRATION FACTOR, $Y = 1.014$				
AVERAGE PRETEST METER CALIBRATION FACTOR, $Y_d = 1.003$				
% DIFFERENCE (Pretest -vs- Post Test) = -1.08% (± 5.0% allowable)				

CAL-SK25/M4METER-WORKBOOK-204T

Signature: [Signature] Date: 12-16-13

ARI Environmental, Inc.

Gas Meter Thermometer Calibration Data Form

Post-Test



Meter Box: M4 0811008

Calibrator: B. Crane

Date: 12/16/2013

Barometric: 29.43

Ambient Temp 72

Reference Thermometer: Altek Thermocouple Source

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		1	0.22	1	0.22
100			99	-0.18	99	-0.18
200			202	0.30	201	0.15
300			301	0.13	301	0.13
400			398	-0.23	398	-0.23
500			498	-0.21	498	-0.21

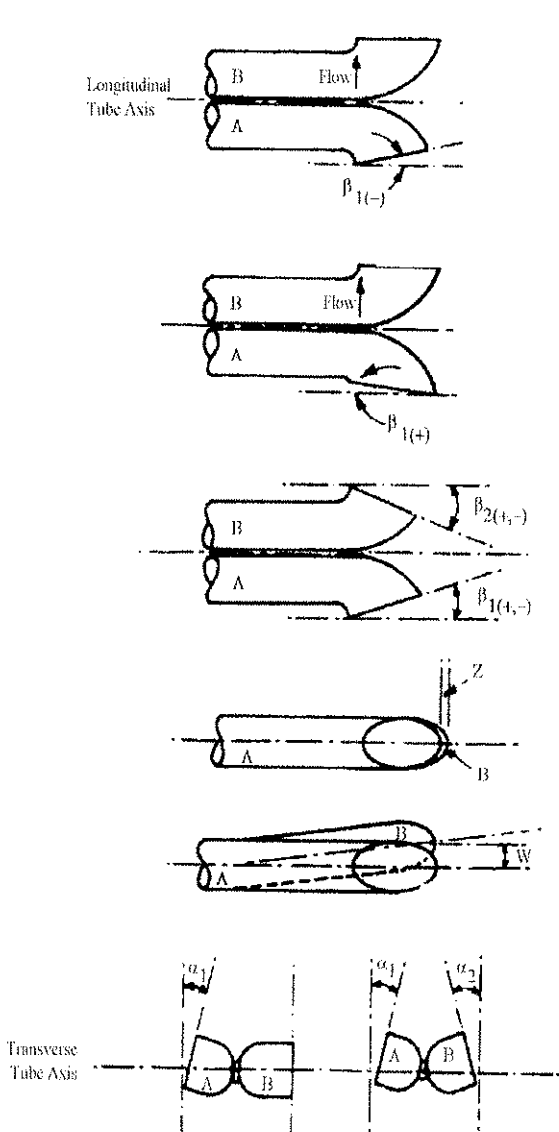
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	98	-0.36	98	-0.36
200	201	0.15	201	0.15	201	0.15
300	300	0.00	300	0.00	300	0.00
400	397	-0.35	397	-0.35	397	-0.35
500	498	-0.21	498	-0.21	498	-0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	1	0.22
200	202	0.30
400	398	-0.23
600	601	0.09
800	802	0.16
1000	1002	0.14

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1398	-0.11
1600	1601	0.05
1800	1799	-0.04

## Pitot Tube Inspection Data

Client Name: \_\_\_\_\_

Pre-Sample  
Date: 4/27/2013Post-Sample  
Date: 12/14/2013


Y	level?	Y
N	obstructions?	N
N	damaged?	N
0	$-10^\circ < \alpha_1 < +10^\circ$	0
2	$-10^\circ < \alpha_2 < +10^\circ$	1
2	$-5^\circ < \beta_1 < +5^\circ$	1
1	$-5^\circ < \beta_2 < +5^\circ$	0
1	$\gamma$	1
1	$\theta$	0
0.720	A	0.72
0.360	$0.2625 < P_A < 0.375$	0.360
0.360	$0.2625 < P_B < 0.375$	0.360
0.250	$0.1875 \leq D_t \leq 0.375$	0.250
0.013	$A \tan \gamma < 0.125''$	0.013
0.01257	$A \tan \theta < 0.03125''$	0.00000
TRUE	$P_A = P_B \pm 0.063$	TRUE
PASS	PASS/FAIL	PASS

**Comments:** 10' effective length s-type pitot assembly, with 1/4" tips, K-type thermocouple and a 3/4" OD sheath.

Pitot tube/probe number 1139 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is hereby assigned a pitot tube calibration factor of 0.84.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

  
12.14.13

**ARI Environmental Inc.**  
**Thermocouple Calibration Data Form**



Calibrator: B. Crane  
 Thermocouple ID. 1139  
                   **pretest**                  **posttest**  
 Date: 4/27/2013 12/14/2013  
 Barometric: 29.37 29.22  
 Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre- Test	T.C	Ice Water	32.0	32.2	-0.04
		Ambient	70.5	68.8	0.32
		Heat Source	292.0	292.1	-0.01
Post- Test	T.C	Ice Water	32.0	32.1	-0.02
		Ambient	65.7	64.5	0.23
		Heat Source	294.3	295.2	-0.12

$a \text{ (temp. diff.)} = (\text{ref.temp} + 460) - (\text{Thermo. temp.} + 460) / (\text{ref. temp.} + 460) \times 100$

Where  $-1.5 < a < 1.5$



BP Whiting Refinery: Whiting, IN

FCCU 500

Test Date: 12/12/13

## APPENDIX E

## Process Data

---

# FCU 500 Process Data



12/12/13 10:00 AM	12/12/13 10:05 AM	65.70
12/12/13 10:05 AM	12/12/13 10:10 AM	65.71
12/12/13 10:10 AM	12/12/13 10:15 AM	65.77
12/12/13 10:15 AM	12/12/13 10:20 AM	65.66
12/12/13 10:20 AM	12/12/13 10:25 AM	65.68
12/12/13 10:25 AM	12/12/13 10:30 AM	65.64
12/12/13 10:30 AM	12/12/13 10:35 AM	65.73
12/12/13 10:35 AM	12/12/13 10:40 AM	65.74
12/12/13 10:40 AM	12/12/13 10:45 AM	65.75
12/12/13 10:45 AM	12/12/13 10:50 AM	65.78
12/12/13 10:50 AM	12/12/13 10:55 AM	65.72
12/12/13 10:55 AM	12/12/13 11:00 AM	65.70
12/12/13 11:00 AM	12/12/13 11:05 AM	65.76
12/12/13 11:05 AM	12/12/13 11:10 AM	65.70
12/12/13 11:10 AM	12/12/13 11:15 AM	65.78
12/12/13 11:15 AM	12/12/13 11:20 AM	65.70
12/12/13 11:20 AM	12/12/13 11:25 AM	65.68
12/12/13 11:25 AM	12/12/13 11:30 AM	65.74
12/12/13 11:30 AM	12/12/13 11:35 AM	65.68
12/12/13 11:35 AM	12/12/13 11:40 AM	65.72
12/12/13 11:40 AM	12/12/13 11:45 AM	65.74
12/12/13 11:45 AM	12/12/13 11:50 AM	65.69
12/12/13 11:50 AM	12/12/13 11:55 AM	65.76
12/12/13 11:55 AM	12/12/13 12:00 PM	65.69
12/12/13 12:00 PM	12/12/13 12:05 PM	65.68
12/12/13 12:05 PM	12/12/13 12:10 PM	65.69
12/12/13 12:10 PM	12/12/13 12:15 PM	65.67
12/12/13 12:15 PM	12/12/13 12:20 PM	65.67
12/12/13 12:20 PM	12/12/13 12:25 PM	65.72
12/12/13 12:25 PM	12/12/13 12:30 PM	65.76
12/12/13 12:30 PM	12/12/13 12:35 PM	65.70
12/12/13 12:35 PM	12/12/13 12:40 PM	65.66
12/12/13 12:40 PM	12/12/13 12:45 PM	65.72
12/12/13 12:45 PM	12/12/13 12:50 PM	65.67
12/12/13 12:50 PM	12/12/13 12:55 PM	65.72
12/12/13 12:55 PM	12/12/13 1:00 PM	65.66
12/12/13 1:00 PM	12/12/13 1:05 PM	65.69
12/12/13 1:05 PM	12/12/13 1:10 PM	65.68
12/12/13 1:10 PM	12/12/13 1:15 PM	65.64
12/12/13 1:15 PM	12/12/13 1:20 PM	65.71
12/12/13 1:20 PM	12/12/13 1:25 PM	65.65
12/12/13 1:25 PM	12/12/13 1:30 PM	65.58
12/12/13 1:30 PM	12/12/13 1:35 PM	65.60
12/12/13 1:35 PM	12/12/13 1:40 PM	65.68
12/12/13 1:40 PM	12/12/13 1:45 PM	65.67
12/12/13 1:45 PM	12/12/13 1:50 PM	65.63
12/12/13 1:50 PM	12/12/13 1:55 PM	65.65
12/12/13 1:55 PM	12/12/13 2:00 PM	65.64
12/12/13 2:00 PM	12/12/13 2:05 PM	65.66
12/12/13 2:05 PM	12/12/13 2:10 PM	65.62
12/12/13 2:10 PM	12/12/13 2:15 PM	65.59

**RUN #1**

**65.726**

**RUN #2**

**65.692**

# FCU 500 Process Data

12/12/13 2:15 PM	12/12/13 2:20 PM	65.69
12/12/13 2:20 PM	12/12/13 2:25 PM	65.60
12/12/13 2:25 PM	12/12/13 2:30 PM	65.67
12/12/13 2:30 PM	12/12/13 2:35 PM	65.70
12/12/13 2:35 PM	12/12/13 2:40 PM	65.63
12/12/13 2:40 PM	12/12/13 2:45 PM	65.68
12/12/13 2:45 PM	12/12/13 2:50 PM	65.61
12/12/13 2:50 PM	12/12/13 2:55 PM	65.62
12/12/13 2:55 PM	12/12/13 3:00 PM	65.64
12/12/13 3:00 PM	12/12/13 3:05 PM	65.55
12/12/13 3:05 PM	12/12/13 3:10 PM	65.58
12/12/13 3:10 PM	12/12/13 3:15 PM	65.56
12/12/13 3:15 PM	12/12/13 3:20 PM	65.58
12/12/13 3:20 PM	12/12/13 3:25 PM	65.59
12/12/13 3:25 PM	12/12/13 3:30 PM	65.56
12/12/13 3:30 PM	12/12/13 3:35 PM	65.63
12/12/13 3:35 PM	12/12/13 3:40 PM	65.62
12/12/13 3:40 PM	12/12/13 3:45 PM	65.56
12/12/13 3:45 PM	12/12/13 3:50 PM	65.64
12/12/13 3:50 PM	12/12/13 3:55 PM	65.62

**RUN #3**

**65.647**



BP Whiting Refinery: Whiting, IN  
FCCU 500  
Test Date: 12/12/13

## **APPENDIX F**

## **Test Program Qualifications**

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## Test Program Qualifications

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ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-12-4), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

### **Steven Flaherty**

Mr. Flaherty is a Senior Project Manager with ARI. His 11 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

### **Brett O'Leary**

Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE  
SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Carol Owens, QSTI/QSTO Review Board

C. David Bagweij, QSTI/QSTO Review Board

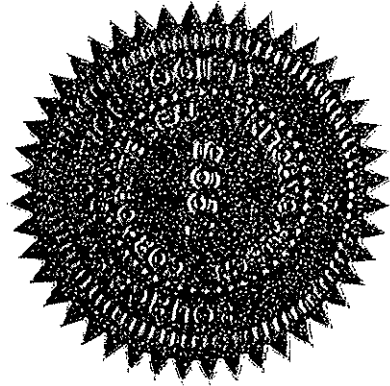
Karen D. Kajiya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION

NO.

2008-237



# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

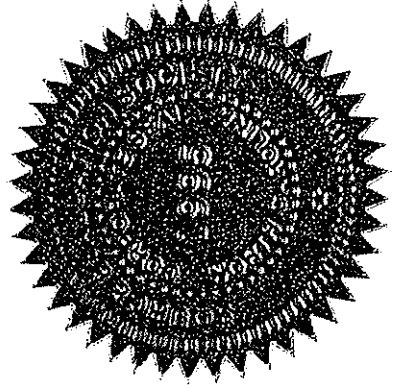
Peter S. Pakalnis, QSTI/QSTO Review Board

Greg T. Owens, QSTI/QSTO Review Board

C. David Bamireff, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board



APPLICATION

NO.

2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS**

ISSUED THIS 26<sup>TH</sup> DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25<sup>TH</sup>, 2018

Peter R. Westlin, QSTI/QSTO Review Board

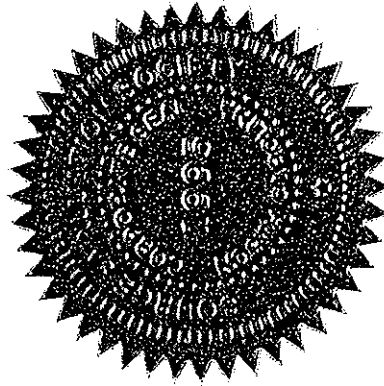
Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kallya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board



APPLICATION  
NO.

2008-237

# SOURCE EVALUATION SOCIETY



## Qualified Source Testing Individual

LET IT BE KNOWN THAT

**STEVEN M. FLAHERTY**

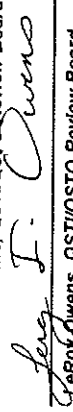
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED  
EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES  
ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

### **HAZARDOUS METALS MEASUREMENT SAMPLING METHODS**

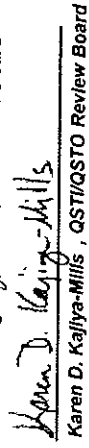
ISSUED THIS 18<sup>TH</sup> DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17<sup>TH</sup>, 2016

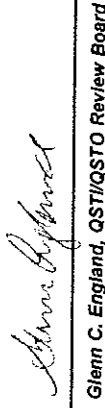
  
Peter R. Westlin, QSTI/QSTO Review Board

  
Peter S. Pakalnis, QSTI/QSTO Review Board

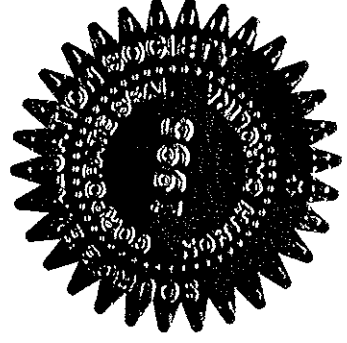
  
Greg I. Owens, QSTI/QSTO Review Board

  
C. David Bagwell, QSTI/QSTO Review Board

  
Karen D. Kalliya-Mills, QSTI/QSTO Review Board

  
Glenn C. England, QSTI/QSTO Review Board

APPLICATION  
NO.  
2008-237



## **Appendix 4 – Commercial Unavailability of Low-Leaking Valve Reports**

**WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form**

Document Number: EF1209.1  
Document Revision Date: 8/6/12  
Document Revision #: 0

Information for Requested Valve / Packing:	Environmental Use Only:
Manufacturer: Williams	Exemption # (LLExempt-YR-XX): -13-08
Valve/Packing Type: Emergency Shut Off Swing Check Valve	Exemption Review Due: 07/29/14
Size: 6"	
Service: BB's (butane-butadine)	Valve Certification Master Updated: Yes / No
Process Unit: OMD STFA	SAP Catalog Updated: Yes / No

**Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response**

Please list all manufacturers contacted as producing an appropriate substitute valve/packing. (Consent Decree requires 3 manufacturers, where available) These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1. Williams Valve Corporation (no other vendors located, see attached note)

**Certified Low Leak Valve / Packing is NOT AVAILABLE due to:**

Please check applicable criteria and provide additional information requested.

✓	Criteria	If Yes, provide:
	Valve/Packing Service/Operating Conditions	Service: Service: BB's Pressure (psig): ~25 psig normally, 65 psig max (sphere RV set point) Temperature (°F): Ambient
X	Equipment Application	Location: Emergency shut off swing check valve on the fill and suction lines to and from STFA TK 3521. Used for emergency shut off only. During normal operation the flapper in the valve is being held up out of the flow path. The swing arm for the flapper extends through a gland to the outside of the valve where a fusible link connects it to a solenoid. Activation of the solenoid will cause it to release the link and drop the flapper. A fire burning through the fusible link will also cause the flapper to drop. Once the flapper has dropped it will prevent liquid from leaving the sphere. Operation of solenoid is tested once a year by Maintenance as part of a PM.
	Seal Performance	Describe: Used for emergency shut off only.
	Service Life	Years: 10-20 years
	Packing Friction	Describe: N/A
	Temperature and Pressure Limitations	Pressure (psig): Temperature (°F):
	Requires Retrofit (i.e. re-piping or space limitations)	Pressure (psig): 65 psig max (sphere RV set point) Temperature (°F): 100 deg F max
	Valve/packing specification identified by licensor of unit or equipment	Describe: As far as I can tell, emergency shut off swing check valves have been installed on all of the sphere fill/suction lines since they were built. They were also installed on the PGP bullets before that unit was decommissioned.
X	Valve/packing vendor or manufacturer recommendation for unit or unit components	Describe: The original "Wheatley" brand valves are no longer manufactured. The Williams brand valves are the only ones found to provide the same functionality (solenoid and fusible link trip). Williams does not have the capability of testing for low emissions.

If more space is needed, attach additional discussion.

**Requestor:** A minimum of 3 manufacturers have been contacted and certified low leak valve / packing is not commercially available for this service for the reasons described above.

Signed: Karen E. Etter

Date: 7/25/13

**WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form**

Document Number: EF1209.1  
Document Revision Date: 8/6/12  
Document Revision #: 0

<b><u>Valve Technical Authority</u></b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b><u>Engineering Authority</u></b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b><u>Environmental Manager</u></b> Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date: <i>Richard Soltz July 25 2013</i>	Signed / Date: <i>7/25/2013</i> <i>(for CST D.O.A)</i>	Signed / Date:

**Supporting Documentation - Commercially Unavailable Claim  
LLE-13-08 - Williams Emergency Shut-Off Swing Check Valve**

The attached documentation provides documentation supporting the fact that there are no other manufacturers that are available for the equipment application as detailed on the commercially unavailable form.

Although my Planning & Scheduling Supervisor Robert Budzowski and I did a thorough internet search for valves like these, we were unable to come up with another manufacturer who made valves like the ones we need to replace (i.e. swing check with solenoid or fusible link activation). McJunkin also searched around their contacts and could not find us another vendor for these valves.

An attempt was made to contact Cameron, who currently owns the Wheatley brand of valves, but they did not respond and their website does not show that they make the Wheatley emergency shut off type of swing check valves anymore.

The only valve we found that matched our needs was the Williams valve.

Karen Etter

*Karen E. Etter*

WILLIAM E.



**WILLIAMS**  
VALVE CORPORATION

38-52 Review Avenue Long Island City, NY 11101 Phone: (718)392-1660, (800)221-1115 Fax: (718) 729-5106

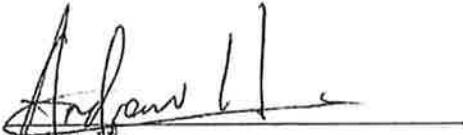
Date: July 23, 2013

To Whom It May Concern,

This letter is to confirm that this valve: Williams 6" APSL-2 150# ANSI EMERGENCY SHUT OFF VALVE had not been tested of low-emissions. At this point we would not classify them as low-emissions valves.

Please feel free to contact us for any questions.

Sincerely,



Andrew N.  
Technical Sales

# WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form

Document Number: EF1209.1  
Document Revision Date: 8/6/12  
Document Revision #: 0

<b>Information for Requested Valve / Packing:</b>	<b>Environmental Use Only:</b>
Manufacturer: <u>Jerguson</u>	Exemption # (LLExempt-YR-XX): <u>-13-09</u>
Valve/Packing Type: <u>Bonnet Valve w/ ball check, Braided Carbon Fiber Valve Stem Packing - 4 rings</u>	Exemption Review Due: <u>9/24/14</u>
Size: <u>3/4" x 3/4" x 1/2"</u>	
Service: <u>Rich Amine, Hydrogen, Pure Hydrogen</u>	Valve Certification Master Updated: Yes / No
Process Unit: <u>CFHU</u>	SAP Catalog Updated: Yes / No

## Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response

Please list all manufacturers contacted as producing an appropriate substitute valve/packing. (Consent Decree requires 3 manufacturers, where available) These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1.
2.
3.

## Certified Low Leak Valve / Packing is NOT AVAILABLE due to:

Please check applicable criteria and provide additional information requested.

✓	Criteria	If Yes, provide:
	Valve/Packing Service/Operating Conditions	Service: <u>Rich Amine, Hydrogen, Pure Hydrogen</u> Pressure (psig): <u>1400</u> Temperature (°F): <u>120 F</u>
	Equipment Application	Location: <u>C-802 level Gauge @ CFHU</u>
	Seal Performance	Describe:
	Service Life	Years:
	Packing Friction	Describe:
	Temperature and Pressure Limitations	Pressure (psig): Temperature (°F):
	Requires Retrofit (i.e. re-piping or space limitations)	Describe:
	Valve/packing specification identified by licensor of unit or equipment	Describe:
	Valve/packing vendor or manufacturer recommendation for unit or unit components	Describe:

If more space is needed, attach additional discussion.

**Requestor:** A minimum of 3 manufacturers have been contacted and certified low leak valve / packing is not commercially available for this service for the reasons described above.

Signed: [Signature]

Date: 9/24/13

<b>Valve Technical Authority</b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b>Engineering Authority</b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b>Environmental Manager</b> Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date: <u>[Signature] 9-24-13</u>	Signed / Date:	Signed / Date:

**WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form**

Document Number: EF1209.1  
Document Revision Date: 8/6/12  
Document Revision #: 0

<b>Information for Requested Valve / Packing:</b>	<b>Environmental Use Only:</b>
Manufacturer: <u>Jerguson</u>	Exemption # (LLExempt-YR-XX):
Valve/Packing Type: <u>Bonnet Valve w/ ball check, Braided Carbon Fiber Valve Stem Packing - 4 rings</u>	Exemption Review Due:
Size: <u>3/4" x 3/4" x 1/2"</u>	
Service: <u>Rich Amine, Hydrogen, Pure Hydrogen</u>	Valve Certification Master Updated: Yes / No
Process Unit: <u>CFHU</u>	SAP Catalog Updated: Yes / No

**Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response**

Please list all manufacturers contacted as producing an appropriate substitute valve/packing. (Consent Decree requires 3 manufacturers, where available) These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1.
2.
3.

**Certified Low Leak Valve / Packing is NOT AVAILABLE due to:**

Please check applicable criteria and provide additional information requested.

√ Criteria	If Yes, provide:
Valve/Packing Service/Operating Conditions	Service: <u>Rich Amine, Hydrogen, Pure Hydrogen</u> Pressure (psig): <u>1400</u> Temperature (°F): <u>120 F</u>
Equipment Application	Location: <u>C-802 level Gauge @ CFHU</u>
Seal Performance	Describe:
Service Life	Years:
Packing Friction	Describe:
Temperature and Pressure Limitations	Pressure (psig): Temperature (°F):
Requires Retrofit (i.e. re-piping or space limitations)	Describe:
Valve/packing specification identified by licensor of unit or equipment	Describe:
Valve/packing vendor or manufacturer recommendation for unit or unit components	Describe:

If more space is needed, attach additional discussion.

<b>Requestor:</b> A minimum of 3 manufacturers have been contacted and certified low leak valve / packing is not commercially available for this service for the reasons described above.	
Signed: <u>[Signature]</u>	Date: <u>9/24/13</u>

<b>Valve Technical Authority</b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b>Engineering Authority</b> Based on my review of the information provided, I approve the determination of commercial unavailability.	<b>Environmental Manager</b> Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date: <u>[Signature] 9-24-13</u>	Signed / Date:	Signed / Date:

**Supporting Documentation - Commercially Unavailable Claim**  
**LLE-13-09 - Jerguson Bonnet Valve with Carbon Fiber Valve Stem Packing**

The attached documentation provides documentation supporting the fact that there are no other manufacturers that are available for the equipment application as detailed on the commercially unavailable form.

## Sobilo, Richard

---

**From:** Gillespie, Jim [jim.gillespie@mrcglobal.com]  
**Sent:** Tuesday, September 24, 2013 11:06 AM  
**To:** Medsker, Shannon  
**Cc:** Gillespie, Jim; Bell, Jeff K  
**Subject:** Jerguson Gauge Glass Valves

Shannon,

In response to your verbal question concerning Jerguson Gage & Glass Co. valves and other possible manufacturer's of this type valve I regret to say I know of no others. There likely are some but most valves for gage glass come as a part of a piece of OEM equipment and thus do not go through the normal distribution channels. In some cases you can't even buy the gage valves without buying the entire gage glass assembly.

Thank You

Jim

**Jim Gillespie**  
Inside Sales Representative

**McJunkin Red Man Corporation**  
*an MRC Global Company*  
**P** +1-219-922-5349  
**F** +1-219-922-5342  
**C** +1-815-693-2022  
jim.gillespie@mrcglobal.com  
www.mrcglobal.com

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9/24/2013

## **Appendix 5 – Waste Gas Minimization for LPG Flare**

**Appendix 3.a - LPG Flare Waste Gas Flow  
30-Day Rolling Average**

<b>DATE</b>	<b>WASTE GAS VOLUMETRIC FLOW 30-DAY AVERAGE (SCFM)</b>	<b>WASTE GAS MASS FLOW 30-DAY AVERAGE (LB/HR)</b>
12/5/2013	29	3,368
12/6/2013	28	3,174
12/7/2013	28	3,182
12/8/2013	23	2,672
12/9/2013	20	2,292
12/10/2013	21	2,411
12/11/2013	23	2,637
12/12/2013	26	3,031
12/13/2013	28	3,164
12/14/2013	28	3,176
12/15/2013	28	3,258
12/16/2013	29	3,352
12/17/2013	30	3,462
12/18/2013	31	3,579
12/19/2013	31	3,558
12/20/2013	31	3,543
12/21/2013	31	3,535
12/22/2013	31	3,534
12/23/2013	32	3,658
12/24/2013	33	3,805
12/25/2013	34	3,891
12/26/2013	35	3,967
12/27/2013	34	3,893
12/28/2013	34	3,855
12/29/2013	34	3,847
12/30/2013	36	4,132
12/31/2013	39	4,461

Note: First 30-day average occurs on December 5, 2013, which is the thirtieth day after the LPG Flare flow meter began operation. Flow from November 6, 2013, through December 5, 2013, is included in the average.

**Appendix 6a – Flare Incident – South Flare  
November 18, 2013**



## Flaring Event or SRP Event RCFA Investigation Report Template

### Event Type Threshold Exceedance

#### Flare Event

- ✓ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period
- ✓ 500,000 standard cubic feet (scf) above the baseline in any 24 hour period [for South Flare and GOHT Flare Only]
- ☐ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period due to Acid Gas or Sour Water Stripper Gas Flaring

#### Sulfur Recovery Plant

- ☐ 250 ppm SO<sub>2</sub> limit exceedances, if the SO<sub>2</sub> discharge to the atmosphere is 500 lbs greater than the amount that would have been emitted if the emission limits have been met.

40 CFR 60.108a(c)(6)(ix):

Flare or SRP TGU: South Flare

App D.54.a. / 40 CFR 60.108a(c)(6)(ii):

	K-401 Shutdown	T-404 Over pressure
Start Date and Time of Event:	11/18/2013 0019	11/18/2013 0714
End Date and Time of Event:	11/18/2013 0333	11/18/2013 1021

App D.54.b. / 40 CFR 60.108a(c)(6)(iii)-(vii)

Volume of Gas Flared or (if SRP Tail Gas Incident) Combusted:

	K-401 Shutdown	T-404 Over pressure	Total
Total Volume of Gas Flared	2.3 mmscf	.9 mmscf	3.2 mmscf
Quantity of SO <sub>2</sub> Emitted:	41,681 lbs	23,975 lbs	65,656 lbs
Quantity of H <sub>2</sub> S Emitted:	443 lbs	255 lbs	698 lbs
Quantity of VOC Emitted:	1,822 lbs	920 lbs	2,742 lbs

\* Standard conditions = 60° F.

\*\* Assumes 98% H<sub>2</sub>S converted to SO<sub>2</sub>

\*\*\* Assumes 98% of VOC destroyed



### Supporting Data and Calculations

**Quantity Resulting From Event:** (Include details and assumptions used in the calculation including volumes and pollutant concentrations of gas. Use additional space as necessary.)



Nov 18 Flaring  
Calcs.docx

#### App D.54.c. / 40 CFR 60.108a(c)(6)(viii)

Identify the steps taken to limit the duration of the event, the volume of gas flared or combusted, and the quantity of SO<sub>2</sub> and VOC emissions.

Two related events occurred within a 24 Hour period, thus they are combined in this report.

A significant process safety event led to emergency depressurization of Vapor Recovery Unit (VRU) 400 and the shutdown of the coker wet gas compressor (K401). Once the cause of the process safety event had been identified and corrected, compressor K-401 was restarted to end the initial flaring.

Following the restart of K401, light materials unexpectedly made their way into the Vapor Recovery Unit (VRU 400) and caused an overpressure condition. This second flaring event ended when the system was purged of light ends and pressures normalized in debutanizer tower T-404.

#### App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Identification of the process unit/s involved in causing, or suspected of having caused, the event. (Use additional space as necessary.)

Vapor Recovery Unit 400 at Coker 2 Complex.

#### App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Describe in detail the cause and the circumstances that lead to the event. (Use additional space as necessary.)

K-401 Shutdown:

At 1210 am on November 18, 2013 a tubing connection on a sample point (T-407 Overhead) gave way, and resulted in a large leak of light hydrocarbon vapor (LPG). To manage this significant process safety risk, the unit emergency depressurization system was activated. The leak was in a location that prevented its isolation and repair until the fire department was able to contain it and emergency personnel could then isolate it. The depressurization shut down the unit wet gas compressor (K-401) and fractionator tower (T-201), and routed vapors to the South Flare. The decision was made to continue Coking operations at reduced rates during the K-401 outage to ensure a safe operating mode could be managed until K-401 was ready for startup. If the Coking operation had been halted during the outage, it could have caused more significant process safety issues and equipment damage. Incomplete coking can lead to a tarry drum which is difficult to cool during the quench step and can lead to a unit fire. Once the leak was isolated and the unit was stabilized, K-401 was restarted to end the flaring.



**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
**Document Review Date:** 04/03/13  
**Document Revision Date:** 04/03/13  
**Document Revision #** 0

**T-404 Overpressure:**

As the VRU 400 was recovering from the K-401 shut down, light ends unexpectedly made their way through the unit into the debutanizer tower (T-404) causing an overpressure in the tower, and a release to the South Flare through relief valve RV4013. This was an unforeseen situation as the new unit was being started up, and the restart of K-401 was not expected to result in the light ends being carried over into the T-404 tower. The event ended when the system was purged of light ends and RV4013 shut.

**40 CFR 60.108a(c)(6)(ix):**

Was the discharge the result of the same root cause(s) identified in a previous analysis? If yes, describe.

No. These events were initiated by a loose sample point connection failure and an unforeseen overpressure condition during system recovery after the initial event.

**40 CFR 60.108a(c)(6)(xi):**

Was the flaring event the result of a planned startup or shutdown of a refinery process unit or ancillary equipment connected with the flare?

Yes. Startup of the new Coker 2 Complex.

Was the flare management plan followed?

Yes. In this instance the loss of a water seal on D-102 Flare Drum seal shut down Flare Gas Recovery.

**App D.54.e. / 40 CFR 60.108a(c)(6)(x)**

Describe the corrective measures undertaken and/or to be undertaken to avoid such an event in the future. Include schedule (including proposed commencement and completion dates) for corrective actions not completed with 45 days. If no corrective actions should be conducted, explain basis for conclusion. (Use additional space as necessary.)

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
Reinspect all sample point connections throughout Complex and ensure they are secure.	Yes 12/2		




**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
**Document Review Date:** 04/03/13  
**Document Revision Date:** 04/03/13  
**Document Revision #** 0

Develop recovery procedures to eliminate potential carryover of light ends into the T-404 tower during a restart after and emergency depressurization of VRU 400.	No	12/6	1/31/2014
Review QA/QC procedures to identify why loose fitting was not identified prior to startup.	No	12/4	1/31/2014

Report Submitted by (Investigation Team):  
Jim Madison, Area Environmental Specialist (Team Lead)  
Ken Ross, Process Engineering Superintendent  
Jenny Thakkar, Process Engineer  
Sheila Sorrentino, Compliance Assurance Specialist

Report Approved By:

		12/26/13
Jon Bortscheller, Operations Superintendent		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in the semi-annual report due under Part VIII and in the NSPS Ja report, as applicable.

## **Supporting Data and Calculations**

---

**From:** Thakkar, Jenny  
**Sent:** Friday, December 06, 2013 2:03 PM  
**To:** Ross, Ken B; Bortscheller, Jonathan M  
**Subject:** Flare calculations for November 18th

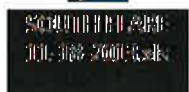
Ken and Jon,

I've reviewed the calculations and the data from the South Flare during the November 18<sup>th</sup> event.  
The total release was:

<b>Total release:</b>	3.2	mmscf
	65,656	lbs sulfur
	698	lbs H2S
	2,742	lbs VOC

For this release, we used the following assumptions:

- Flow as measured by the flow meter at the south flare.
- Total sulfur as measured by the total sulfur analyzer at the south flare. I sense checked this based on the expected H2S concentration of the stream per Hysys.
- H2S analyzer went to 0, so per the environmental group, we used the total sulfur number and assumed a 98% flare destruction efficiency, so 2% left the flare as H2S.
- VOC data as measured by the analyzer at the south flare



Please let me know if you have any questions.

Thanks,

**Jenny Thakkar**

Crude and Coking Process Engineer

Work: 219.473.1332

Radio#: 635

[Jenny.Thakkar@bp.com](mailto:Jenny.Thakkar@bp.com)

	Final WG Flow (from F33651CR) (MMscfh)	TS HI Range (%)	WG VOC (%)	SO2 (lb/hr)	SO2 (lb)	VOC (lb/hr)	VOC (lb)
11/18/13 0:19	2.8	0.64	13.71	3,026	3,026	1,149	1,149
11/18/13 0:20	2.3	0.92	13.71	3,573	3,573	949	949
11/18/13 0:21	1.8	3.74	13.71	11,368	11,368	741	741
11/18/13 0:22	1.7	7.97	13.71	22,880	22,880	706	706
11/18/13 0:23	1.4	10.42	13.71	24,634	24,634	568	568
11/18/13 0:24	1.2	12.4	13.71	25,127	25,127	360	360
11/18/13 0:25	1.8	13.86	13.71	42,129	42,129	727	727
11/18/13 0:26	1.4	15.26	13.91	36,076	36,076	584	584
11/18/13 0:27	1.6	16.05	14.3	43,365	43,365	680	680
11/18/13 0:28	1.6	16.22	14.3	43,824	43,824	695	695
11/18/13 0:29	1.6	15.88	14.3	42,905	42,905	688	688
11/18/13 0:30	1.7	15.52	14.3	44,553	44,553	731	731
11/18/13 0:31	1.6	15.38	14.3	41,554	41,554	709	709
11/18/13 0:32	1.6	15.2	14.3	41,068	41,068	717	717
11/18/13 0:33	1.6	14.91	14.3	40,285	40,285	680	680
11/18/13 0:34	1.6	14.48	37.24	39,123	39,123	1,530	1,530
11/18/13 0:35	1.5	14.28	37.24	36,171	36,171	1,465	1,465
11/18/13 0:36	1.5	14.26	37.24	36,120	36,120	1,514	1,514
11/18/13 0:37	1.6	13.99	37.24	37,799	37,799	1,563	1,563
11/18/13 0:38	1.6	13.77	37.24	37,204	37,204	1,530	1,530
11/18/13 0:39	1.5	13.82	37.24	35,006	35,006	1,498	1,498
11/18/13 0:40	1.6	13.67	37.24	36,934	36,934	1,579	1,579
11/18/13 0:41	1.4	13.36	35.67	31,585	31,585	1,315	1,315
11/18/13 0:42	1.6	13.6	32.53	36,745	36,745	1,337	1,337
11/18/13 0:43	1.5	13.98	32.53	35,411	35,411	1,295	1,295
11/18/13 0:44	1.4	14.02	32.53	33,145	33,145	1,196	1,196
11/18/13 0:45	1.4	13.66	32.53	32,294	32,294	1,154	1,154
11/18/13 0:46	1.5	13.23	32.53	33,511	33,511	1,267	1,267
11/18/13 0:47	1.4	13.11	32.53	30,994	30,994	1,225	1,225
11/18/13 0:48	1.4	12.9	32.53	30,497	30,497	1,182	1,182
11/18/13 0:49	1.2	12.69	34.41	25,715	25,715	1,035	1,035
11/18/13 0:50	0.2	12.69	35.35	4,286	4,286	234	234
11/18/13 0:51	0	12.5	35.35	0	0	0	0
11/18/13 0:52	0.2	12.49	35.35	4,218	4,218	203	203
11/18/13 0:53	1.3	12.64	35.35	27,748	27,748	1,216	1,216
11/18/13 0:54	1.2	12.71	35.35	25,755	25,755	1,170	1,170
11/18/13 0:55	1.2	12.66	35.35	25,654	25,654	1,138	1,138
11/18/13 0:56	0.6	12.56	35.35	12,726	12,726	608	608
11/18/13 0:57	0	12.68	35.44	0	0	0	0
11/18/13 0:58	0	12.67	35.44	0	0	0	0
11/18/13 0:59	0	12.75	35.44	0	0	0	0
11/18/13 1:00	0	12.98	35.44	0	0	0	0
11/18/13 1:01	1	13.1	35.44	22,121	22,121	1,004	1,004
11/18/13 1:02	1.2	13.02	35.44	26,384	26,384	1,166	1,166
11/18/13 1:03	1.2	12.98	35.44	26,302	26,302	1,134	1,134
11/18/13 1:04	1.2	13.02	34.73	26,384	26,384	1,141	1,141
11/18/13 1:05	1.2	13.02	31.18	26,384	26,384	1,002	1,002
11/18/13 1:06	1.2	13	31.18	26,343	26,343	1,030	1,030
11/18/13 1:07	1.2	12.83	31.18	25,999	25,999	1,044	1,044
11/18/13 1:08	1.1	12.64	31.18	23,479	23,479	917	917
11/18/13 1:09	1.1	12.52	31.18	23,256	23,256	945	945
11/18/13 1:10	1.2	12.6	31.18	25,532	25,532	973	973
11/18/13 1:11	1.1	12.38	31.18	22,996	22,996	903	903
11/18/13 1:12	1.1	12.24	32.76	22,736	22,736	968	968
11/18/13 1:13	1.1	12.06	34.34	22,402	22,402	1,049	1,049
11/18/13 1:14	1	11.87	34.34	20,044	20,044	939	939
11/18/13 1:15	1.1	11.83	34.34	21,974	21,974	986	986
11/18/13 1:16	1.1	11.55	34.34	21,454	21,454	1,002	1,002
11/18/13 1:17	0.8	11.41	34.34	15,414	15,414	783	783
11/18/13 1:18	0.8	11.34	34.34	15,319	15,319	798	798
11/18/13 1:19	0.5	11.18	34.34	9,440	9,440	438	438
11/18/13 1:20	1	11.03	33.39	18,626	18,626	924	924
11/18/13 1:21	0.5	10.84	33.2	9,153	9,153	445	445
11/18/13 1:22	0.8	10.59	33.2	14,306	14,306	783	783
11/18/13 1:23	0.7	10.4	33.2	12,293	12,293	614	614
11/18/13 1:24	0.7	10.16	33.2	12,010	12,010	614	614
11/18/13 1:25	0.8	9.93	33.2	13,415	13,415	768	768
11/18/13 1:26	0.7	9.75	33.2	11,525	11,525	645	645
11/18/13 1:27	0.8	9.52	32.2	12,861	12,861	737	737
11/18/13 1:28	0.2	9.36	27.19	3,161	3,161	269	269
11/18/13 1:29	1	9.1	27.19	15,367	15,367	746	746
11/18/13 1:30	1.1	8.99	27.19	16,699	16,699	794	794
11/18/13 1:31	1	8.93	27.19	15,080	15,080	733	733
11/18/13 1:32	1	8.8	27.19	14,860	14,860	733	733
11/18/13 1:33	1	8.8	27.19	14,860	14,860	733	733
11/18/13 1:34	1	8.75	27.19	14,776	14,776	733	733
11/18/13 1:35	1	8.78	29.21	14,826	14,826	803	803

11/18/13 1:36	1	8.85	33.24	14,945	14,945	906	906
11/18/13 1:37	1.1	8.9	33.24	16,532	16,532	966	966
11/18/13 1:38	1.1	9.12	33.24	16,941	16,941	996	996
11/18/13 1:39	1	9.23	33.24	15,586	15,586	921	921
11/18/13 1:40	1.1	9.3	33.24	17,275	17,275	996	996
11/18/13 1:41	1.1	9.18	33.24	17,052	17,052	981	981
11/18/13 1:42	1	9.05	33.24	15,282	15,282	921	921
11/18/13 1:43	1.1	9.02	32.39	16,755	16,755	974	974
11/18/13 1:44	1.1	8.99	31.96	16,699	16,699	919	919
11/18/13 1:45	1.1	9.12	31.96	16,941	16,941	919	919
11/18/13 1:46	0.9	9.18	31.96	13,952	13,952	802	802
11/18/13 1:47	0.9	9.34	31.96	14,195	14,195	788	788
11/18/13 1:48	0.9	9.48	31.96	14,408	14,408	788	788
11/18/13 1:49	0.9	9.52	31.96	14,468	14,468	788	788
11/18/13 1:50	0.9	9.63	31.96	14,636	14,636	788	788
11/18/13 1:51	0.9	9.64	34.16	14,651	14,651	836	836
11/18/13 1:52	1	9.21	34.16	15,553	15,553	883	883
11/18/13 1:53	0.9	8.81	34.16	13,389	13,389	836	836
11/18/13 1:54	0.8	8.5	34.16	11,483	11,483	774	774
11/18/13 1:55	0.9	8.25	34.16	12,538	12,538	852	852
11/18/13 1:56	0.9	8.16	34.16	12,401	12,401	805	805
11/18/13 1:57	0.9	8.04	34.16	12,219	12,219	852	852
11/18/13 1:58	0.9	8.03	32.52	12,204	12,204	818	818
11/18/13 1:59	0.9	7.96	29.24	12,098	12,098	687	687
11/18/13 2:00	0.9	7.93	29.24	12,052	12,052	728	728
11/18/13 2:01	0.8	8.01	29.24	10,821	10,821	674	674
11/18/13 2:02	0.9	7.94	29.24	12,067	12,067	687	687
11/18/13 2:03	0.9	7.98	29.24	12,128	12,128	701	701
11/18/13 2:04	0.8	7.96	29.24	10,753	10,753	674	674
11/18/13 2:05	0.9	7.92	29.24	12,037	12,037	714	714
11/18/13 2:06	0.8	7.94	28.04	10,726	10,726	638	638
11/18/13 2:07	0.9	7.84	26.84	11,915	11,915	681	681
11/18/13 2:08	0.8	7.86	26.84	10,618	10,618	618	618
11/18/13 2:09	0.8	7.87	26.84	10,632	10,632	630	630
11/18/13 2:10	0.8	7.86	26.84	10,618	10,618	618	618
11/18/13 2:11	0.8	7.88	26.84	10,645	10,645	567	567
11/18/13 2:12	0.8	7.89	26.84	10,659	10,659	605	605
11/18/13 2:13	0.8	7.98	26.84	10,780	10,780	605	605
11/18/13 2:14	0.8	7.98	26.54	10,780	10,780	598	598
11/18/13 2:15	0.8	8.07	26.48	10,902	10,902	585	585
11/18/13 2:16	0.6	8.09	26.48	8,197	8,197	460	460
11/18/13 2:17	0.3	8.03	26.48	4,068	4,068	199	199
11/18/13 2:18	0	8.08	26.48	0		0	
11/18/13 2:19	0.1	8.04	26.48	1,358	1,358	100	100
11/18/13 2:20	0.1	8.03	26.48	1,356	1,356	112	112
11/18/13 2:21	0	8.08	26.56	0		0	
11/18/13 2:22	0.2	8.01	26.94	2,705	2,705	177	177
11/18/13 2:23	0	8.1	26.94	0		0	
11/18/13 2:24	0	8.11	26.94	0		0	
11/18/13 2:25	0	8.09	26.94	0		0	
11/18/13 2:26	0.4	8.14	26.94	5,498	5,498	291	291
11/18/13 2:27	0.1	8.09	26.94	1,366	1,366	101	101
11/18/13 2:28	0	8.05	26.94	0		0	
11/18/13 2:29	0	8.13	25.5	0		0	
11/18/13 2:30	0.3	8.13	24.06	4,119	4,119	178	178
11/18/13 2:31	0	8.13	24.06	0		0	
11/18/13 2:32	0	8.21	24.06	0		0	
11/18/13 2:33	0	8.22	24.06	0		0	
11/18/13 2:34	0.4	8.16	24.06	5,512	5,512	256	256
11/18/13 2:35	0	8.17	24.06	0		0	

11/18/13 2:36	0	8.11	24.06	0	0		
11/18/13 2:37	0	8.06	25.94	0	0		
11/18/13 2:38	0.5	8	26.88	6,755	6,755	389	389
11/18/13 2:39	0.4	8.06	26.88	5,444	5,444	301	301
11/18/13 2:40	0.3	8.17	26.88	4,139	4,139	201	201
11/18/13 2:41	0.4	8.19	26.88	5,532	5,532	339	339
11/18/13 2:42	0.8	8.12	26.88	10,969	10,969	614	614
11/18/13 2:43	0	8.22	26.88	0	0	0	
11/18/13 2:44	0	8.25	26.88	0	0	0	
11/18/13 2:45	0	8.22	26.42	0	0	0	
11/18/13 2:46	0	8.13	26.42	0	0	0	
11/18/13 2:47	0	7.99	26.42	0	0	0	
11/18/13 2:48	0	7.74	26.42	0	0	0	
11/18/13 2:49	0	7.3	26.42	0	0	0	
11/18/13 2:50	0.3	7.1	26.42	3,597	3,597	197	197
11/18/13 2:51	0	7.3	26.42	0	0	0	
11/18/13 2:52	0	7.62	25.98	0	0	0	
11/18/13 2:53	0	7.76	25.1	0	0	0	
11/18/13 2:54	0	7.74	25.1	0	0	0	
11/18/13 2:55	0	7.85	25.1	0	0	80	80
11/18/13 2:56	0	7.99	25.1	0	0	0	
11/18/13 2:57	0.2	8.01	25.1	2,705	2,705	126	126
11/18/13 2:58	0.5	7.8	25.1	6,586	6,586	367	367
11/18/13 2:59	0.6	7.54	25.1	7,639	7,639	413	413
11/18/13 3:00	0.4	7.43	26.66	5,019	5,019	316	316
11/18/13 3:01	0.1	7.38	28.23	1,246	1,246	90	90
11/18/13 3:02	0	7.44	28.23	0	0	0	
11/18/13 3:03	0	7.6	28.23	0	0	0	
11/18/13 3:04	0	7.66	28.23	0	0	0	
11/18/13 3:05	0.1	7.8	28.23	1,317	1,317	77	77
11/18/13 3:06	0	7.96	28.23	0	0	0	
11/18/13 3:07	0	8.09	28.23	0	0	0	
11/18/13 3:08	0	8.14	30.26	0	0	0	
11/18/13 3:09	0	8.15	30.66	0	0	0	
11/18/13 3:10	0.2	8.15	30.66	2,753	2,753	137	137
11/18/13 3:11	0	8.2	30.66	0	0	0	
11/18/13 3:12	0.2	8.22	30.66	2,776	2,776	137	137
11/18/13 3:13	0.6	8.26	30.66	8,369	8,369	493	493
11/18/13 3:14	0.6	8.19	30.66	8,298	8,298	466	466
11/18/13 3:15	0.6	8.1	29.92	8,207	8,207	470	470
11/18/13 3:16	0.6	8.11	26.22	8,217	8,217	414	414
11/18/13 3:17	0.6	8.19	26.22	8,298	8,298	426	426
11/18/13 3:18	0.6	8.22	26.22	8,328	8,328	426	426
11/18/13 3:19	0.6	8.11	26.22	8,217	8,217	414	414
11/18/13 3:20	0.5	8.02	26.22	6,772	6,772	389	389
11/18/13 3:21	0.5	8.04	26.22	6,788	6,788	353	353
11/18/13 3:22	0.4	8.07	26.22	5,451	5,451	316	316
11/18/13 3:23	0.4	8.1	26.04	5,471	5,471	292	292
11/18/13 3:24	0.4	8.06	26.04	5,444	5,444	280	280
11/18/13 3:25	0.3	7.98	26.04	4,043	4,043	219	219
11/18/13 3:26	0.3	7.73	26.04	3,916	3,916	219	219
11/18/13 3:27	0.3	7.68	26.04	3,891	3,891	231	231
11/18/13 3:28	0.3	7.81	26.04	3,957	3,957	219	219
11/18/13 3:29	0.3	7.89	26.04	3,997	3,997	207	207
11/18/13 3:30	0.2	7.94	25.85	2,682	2,682	146	146
11/18/13 3:31	0.2	8	25.48	2,702	2,702	143	143
11/18/13 3:32	0.2	8.04	25.48	2,715	2,715	108	108
11/18/13 3:33	0.1	7.93	25.48	1,339	1,339	72	72
11/18/13 3:34	0	7.9	25.48	0	0	24	24
11/18/13 3:35	0	7.95	25.48	0	0	0	
11/18/13 3:36	0	7.79	25.48	0	0	0	
11/18/13 3:37	0	7.62	25.48	0	0	0	
11/18/13 3:38	0	7.57	25.66	0	0	0	
11/18/13 3:39	0	7.44	25.84	0	0	0	
11/18/13 3:40	0	7.4	25.84	0	0	0	
11/18/13 3:41	0	7.36	25.84	0	0	0	
11/18/13 3:42	0	7.31	25.84	0	0	0	
<b>Total</b>	<b>2.3</b>			<b>Total (lbs)</b>	<b>41,681</b>		<b>1,822</b>
				<b>Total H2S (lbs)</b>	<b>443</b>		

<b>Total release:</b>	3.2	mmscf
	65,656	lbs sulfur
	698	lbs H2S
	2,742	lbs VOC

	Final WG Flow (from F33651CR) (MMscfh)	TS HI Range (%)	WG VOC (%)	SO2 (lb/hr)	SO2 (lb)	VOC (lb/hr)	VOC (lb)
11/18/13 7:14	0.2	3.54	13.02	1,196	1,196	93	93
11/18/13 7:15	0.8	3.54	13.02	4,782	4,782	279	279
11/18/13 7:16	0.9	3.65	13.02	5,547	5,547	322	322
11/18/13 7:17	1	3.94	13.02	6,653	6,653	366	366
11/18/13 7:18	1	3.78	13.02	6,383	6,383	391	391
11/18/13 7:19	0.9	4.91	13.02	7,462	7,462	341	341
11/18/13 7:20	0.9	9.28	13.02	14,104	14,104	347	347
11/18/13 7:21	0.9	13.51	12.88	20,532	20,532	344	344
11/18/13 7:22	0.9	16.16	12.74	24,560	24,560	328	328
11/18/13 7:23	1	17.25	12.74	29,129	29,129	352	352
11/18/13 7:24	1	18.11	12.74	30,582	30,582	364	364
11/18/13 7:25	1	18.7	12.74	31,578	31,578	364	364
11/18/13 7:26	1	19.18	12.74	32,388	32,388	346	346
11/18/13 7:27	0.9	19.73	12.74	29,985	29,985	328	328
11/18/13 7:28	0.8	20.19	12.74	27,275	27,275	303	303
11/18/13 7:29	0.8	20.55	37.16	27,761	27,761	734	734
11/18/13 7:30	0.8	20.75	42.04	28,032	28,032	823	823
11/18/13 7:31	0.8	20.81	42.04	28,113	28,113	788	788
11/18/13 7:32	0.7	20.72	42.04	24,492	24,492	720	720
11/18/13 7:33	0.7	20.62	42.04	24,374	24,374	703	703
11/18/13 7:34	0.6	20.5	42.04	20,770	20,770	634	634
11/18/13 7:35	0.6	20.28	42.04	20,548	20,548	617	617
11/18/13 7:36	0.6	20.23	42.04	20,497	20,497	600	600
11/18/13 7:37	0.6	20.33	45.27	20,598	20,598	651	651
11/18/13 7:38	0.5	20.31	45.27	17,148	17,148	560	560
11/18/13 7:39	0.5	20.21	45.27	17,064	17,064	579	579
11/18/13 7:40	0.5	20.23	45.27	17,081	17,081	579	579
11/18/13 7:41	0.5	20.27	45.27	17,115	17,115	579	579
11/18/13 7:42	0.5	20.29	45.27	17,131	17,131	524	524
11/18/13 7:43	0.4	20.36	45.27	13,752	13,752	452	452
11/18/13 7:44	0.5	20.37	45.37	17,199	17,199	524	524
11/18/13 7:45	0.4	20.38	45.58	13,766	13,766	470	470
11/18/13 7:46	0.5	20.3	45.58	17,140	17,140	542	542
11/18/13 7:47	0.5	20.16	45.58	17,022	17,022	506	506
11/18/13 7:48	0.5	19.99	45.58	16,878	16,878	506	506
11/18/13 7:49	0.5	19.76	45.58	16,684	16,684	524	524
11/18/13 7:50	0.5	19.54	45.58	16,498	16,498	542	542
11/18/13 7:51	0.4	19.37	45.58	13,084	13,084	488	488
11/18/13 7:52	0.5	19.28	48.67	16,279	16,279	603	603
11/18/13 7:53	0.4	19.13	50.21	12,922	12,922	528	528
11/18/13 7:54	0.4	19.12	50.21	12,915	12,915	506	506
11/18/13 7:55	0.4	19.16	50.21	12,942	12,942	528	528
11/18/13 7:56	0.4	19.11	50.21	12,908	12,908	506	506
11/18/13 7:57	0.4	19.04	50.21	12,861	12,861	506	506
11/18/13 7:58	0.4	19.04	50.21	12,861	12,861	464	464
11/18/13 7:59	0.3	18.98	50.21	9,615	9,615	380	380
11/18/13 8:00	0.3	18.91	58.54	9,580	9,580	416	416
11/18/13 8:01	0.2	18.89	58.54	6,380	6,380	390	390
11/18/13 8:02	0.2	18.88	58.54	6,376	6,376	338	338
11/18/13 8:03	0.2	18.88	58.54	6,376	6,376	312	312
11/18/13 8:04	0.2	18.84	58.54	6,363	6,363	312	312
11/18/13 8:05	0.2	18.91	58.54	6,386	6,386	312	312
11/18/13 8:06	0.2	18.88	58.54	6,376	6,376	312	312
11/18/13 8:07	0.2	18.84	59.05	6,363	6,363	316	316
11/18/13 8:08	0.1	18.84	61.61	3,181	3,181	251	251
11/18/13 8:09	0.2	18.86	61.61	6,370	6,370	278	278
11/18/13 8:10	0.2	18.83	61.61	6,359	6,359	278	278
11/18/13 8:11	0.2	18.9	61.61	6,383	6,383	306	306
11/18/13 8:12	0.2	18.98	61.61	6,410	6,410	251	251
11/18/13 8:13	0.1	18.97	61.61	3,203	3,203	223	223
11/18/13 8:14	0.1	18.91	61.61	3,193	3,193	223	223
11/18/13 8:15	0.2	18.9	61.34	6,383	6,383	250	250
11/18/13 8:16	0.1	18.91	61.06	3,193	3,193	166	166
11/18/13 8:17	0.2	18.96	61.06	6,403	6,403	249	249
11/18/13 8:18	0.2	19	61.06	6,417	6,417	249	249
11/18/13 8:19	0.1	19.04	61.06	3,215	3,215	249	249
11/18/13 8:20	0.1	19.13	61.06	3,230	3,230	221	221

11/18/13 8:21	0.2	19.16	61.06	6,471	6,471	304	304
11/18/13 8:22	0.2	19.13	61.06	6,461	6,461	304	304
11/18/13 8:23	0.2	19.16	59.68	6,471	6,471	378	378
11/18/13 8:24	0.3	19.13	59.4	9,691	9,691	484	484
11/18/13 8:25	0.3	19.08	59.4	9,666	9,666	538	538
11/18/13 8:26	0.2	19.11	59.4	6,454	6,454	296	296
11/18/13 8:27	0.4	18.97	59.4	12,814	12,814	592	592
11/18/13 8:28	0.3	18.88	59.4	9,565	9,565	430	430
11/18/13 8:29	0.3	18.81	59.4	9,529	9,529	538	538
11/18/13 8:30	0.4	18.7	51.58	12,631	12,631	525	525
11/18/13 8:31	0.4	18.65	12.58	12,597	12,597	106	106
11/18/13 8:32	0.4	18.63	12.58	12,584	12,584	101	101
11/18/13 8:33	0.4	18.66	12.58	12,604	12,604	111	111
11/18/13 8:34	0.3	18.76	12.58	9,504	9,504	88	88
11/18/13 8:35	0.3	18.68	12.58	9,463	9,463	92	92
11/18/13 8:36	0.4	18.43	12.58	12,449	12,449	101	101
11/18/13 8:37	0.4	18.12	12.58	12,239	12,239	97	97
11/18/13 8:38	0.4	17.72	12.66	11,969	11,969	107	107
11/18/13 8:39	0.4	17.21	13.06	11,625	11,625	112	112
11/18/13 8:40	0.2	16.88	13.06	5,701	5,701	73	73
11/18/13 8:41	0	16.75	13.06	0	0	0	0
11/18/13 8:42	0.4	16.75	13.06	11,314	11,314	112	112
11/18/13 8:43	0.4	16.92	13.06	11,429	11,429	117	117
11/18/13 8:44	0.4	17.12	13.06	11,564	11,564	117	117
11/18/13 8:45	0.3	17.34	13.06	8,784	8,784	97	97
11/18/13 8:46	0.3	17.51	12.68	8,871	8,871	84	84
11/18/13 8:47	0.3	17.66	12.68	8,946	8,946	84	84
11/18/13 8:48	0.3	17.85	12.68	9,043	9,043	84	84
11/18/13 8:49	0.2	17.92	12.68	6,052	6,052	51	51
11/18/13 8:50	0	17.91	12.68	0	0	0	0
11/18/13 8:51	0	17.91	12.68	0	0	0	0
11/18/13 8:52	0	17.91	12.68	0	0	14	14
11/18/13 8:53	0.1	17.95	12.68	3,031	3,031	23	23
11/18/13 8:54	0.2	18.05	64.97	6,096	6,096	356	356
11/18/13 8:55	0.1	18.07	64.97	3,051	3,051	178	178
11/18/13 8:56	0.2	18.12	64.97	6,120	6,120	356	356
11/18/13 8:57	0.2	18.13	64.97	6,123	6,123	326	326
11/18/13 8:58	0.3	18.13	64.97	9,185	9,185	534	534
11/18/13 8:59	0.2	18.12	64.97	6,120	6,120	445	445
11/18/13 9:00	0.3	18.08	64.97	9,159	9,159	534	534
11/18/13 9:01	0.3	18.01	65.28	9,124	9,124	476	476
11/18/13 9:02	0.3	17.94	65.9	9,088	9,088	481	481
11/18/13 9:03	0.3	17.88	65.9	9,058	9,058	481	481
11/18/13 9:04	0.2	17.76	65.9	5,998	5,998	421	421
11/18/13 9:05	0.2	17.66	65.9	5,964	5,964	361	361
11/18/13 9:06	0.2	17.56	65.9	5,931	5,931	421	421
11/18/13 9:07	0.2	17.48	65.9	5,904	5,904	451	451
11/18/13 9:08	0.2	17.4	65.9	5,877	5,877	391	391
11/18/13 9:09	0.2	17.29	66.64	5,839	5,839	335	335
11/18/13 9:10	0.2	17.15	67.38	5,792	5,792	369	369
11/18/13 9:11	0.2	16.91	67.38	5,711	5,711	400	400
11/18/13 9:12	0.2	16.66	67.38	5,627	5,627	338	338
11/18/13 9:13	0.2	16.39	67.38	5,535	5,535	308	308
11/18/13 9:14	0.2	16.13	67.38	5,448	5,448	308	308
11/18/13 9:15	0.1	15.97	67.38	2,697	2,697	277	277
11/18/13 9:16	0.1	15.66	67.38	2,644	2,644	277	277
11/18/13 9:17	0.1	15.27	69.01	2,579	2,579	220	220
11/18/13 9:18	0.1	14.96	69.33	2,526	2,526	254	254
11/18/13 9:19	0.1	14.63	69.33	2,471	2,471	222	222
11/18/13 9:20	0.1	14.32	69.33	2,418	2,418	190	190
11/18/13 9:21	0.1	14	69.33	2,364	2,364	190	190
11/18/13 9:22	0.1	13.68	69.33	2,310	2,310	190	190
11/18/13 9:23	0.1	13.32	69.33	2,249	2,249	190	190
11/18/13 9:24	0.1	13.07	69.81	2,207	2,207	127	127
11/18/13 9:25	0	12.84	72.19	0	0	66	66
11/18/13 9:26	0.1	12.63	72.19	2,133	2,133	199	199
11/18/13 9:27	0.1	12.5	72.19	2,111	2,111	199	199
11/18/13 9:28	0.1	12.38	72.19	2,091	2,091	199	199
11/18/13 9:29	0	12.31	72.19	0	0	99	99
11/18/13 9:30	0	12.21	72.19	0	0	0	0

11/18/13 9:31	0	12.05	72.19	0		0	
11/18/13 9:32	0	11.9	73.01	0		0	
11/18/13 9:33	0	11.9	73.83	0		0	
11/18/13 9:34	0	11.91	73.83	0		0	
11/18/13 9:35	0	11.91	73.83	0		0	
11/18/13 9:36	0	11.78	73.83	0		0	
11/18/13 9:37	0	11.61	73.83	0		0	
11/18/13 9:38	0	11.43	73.83	0		0	
11/18/13 9:39	0	11.17	73.83	0		0	
11/18/13 9:40	0	11.1	73.68	0		0	
11/18/13 9:41	0	11.09	73.61	0		68	68
11/18/13 9:42	0.1	11.11	73.61	1,876	1,876	170	170
11/18/13 9:43	0	11.03	73.61	0		102	102
11/18/13 9:44	0.1	10.83	73.61	1,829	1,829	136	136
11/18/13 9:45	0.1	10.52	73.61	1,776	1,776	204	204
11/18/13 9:46	0.1	10.07	73.61	1,700	1,700	204	204
11/18/13 9:47	0	9.97	74.34	0		0	
11/18/13 9:48	0.1	9.78	75.07	1,652	1,652	174	174
11/18/13 9:49	0.1	9.37	75.07	1,582	1,582	208	208
11/18/13 9:50	0.1	8.79	75.07	1,484	1,484	139	139
11/18/13 9:51	0	8.04	75.07	0		0	
11/18/13 9:52	0	7.25	75.07	0		0	
11/18/13 9:53	0	6.26	75.07	0		0	
11/18/13 9:54	0	5.64	75.07	0		0	
11/18/13 9:55	0	5.42	77.35	0		0	
11/18/13 9:56	0	5.54	77.81	0		0	
11/18/13 9:57	0	5.88	77.81	0		0	
11/18/13 9:58	0	6.36	77.81	0		0	
11/18/13 9:59	0.1	6.72	77.81	1,135	1,135	145	145
11/18/13 10:00	0.1	6.72	77.81	1,135	1,135	217	217
11/18/13 10:01	0.1	6.39	77.81	1,079	1,079	217	217
11/18/13 10:02	0.1	6.15	77.31	1,039	1,039	216	216
11/18/13 10:03	0.1	6.18	74.79	1,044	1,044	213	213
11/18/13 10:04	0.1	6.46	74.79	1,091	1,091	178	178
11/18/13 10:05	0.1	6.86	74.79	1,158	1,158	142	142
11/18/13 10:06	0.1	7.02	74.79	1,185	1,185	284	284
11/18/13 10:07	0.2	6.9	74.79	2,330	2,330	391	391
11/18/13 10:08	0.2	7.05	74.79	2,381	2,381	462	462
11/18/13 10:09	0.2	7.06	74.79	2,384	2,384	355	355
11/18/13 10:10	0.2	6.93	74.74	2,340	2,340	355	355
11/18/13 10:11	0.2	6.69	74.65	2,259	2,259	425	425
11/18/13 10:12	0.2	6.46	74.65	2,182	2,182	566	566
11/18/13 10:13	0.2	5.88	74.65	1,986	1,986	460	460
11/18/13 10:14	0.3	5.51	74.65	2,791	2,791	637	637
11/18/13 10:15	0.3	5.84	74.65	2,959	2,959	637	637
11/18/13 10:16	0.3	7	74.65	3,546	3,546	637	637
11/18/13 10:17	0.2	7.84	74.65	2,648	2,648	460	460
11/18/13 10:18	0.2	7.98	76	2,695	2,695	432	432
11/18/13 10:19	0.1	7.82	76.67	1,321	1,321	218	218
11/18/13 10:20	0.1	7.47	76.67	1,261	1,261	218	218
11/18/13 10:21	0.1	7.14	76.67	1,206	1,206	182	182
11/18/13 10:22	0	7.05	76.67	0		0	
11/18/13 10:23	0	6.9	76.67	0		0	
11/18/13 10:24	0	6.69	76.67	0		0	
11/18/13 10:25	0	6.57	76.67	0		0	
11/18/13 10:26	0	6.56	76.89	0		0	
11/18/13 10:27	0	6.64	76.89	0		0	
11/18/13 10:28	0	6.7	76.89	0		0	
11/18/13 10:29	0	6.62	76.89	0		0	
11/18/13 10:30	0	6.54	76.89	0		0	
11/18/13 10:31	0	6.58	76.89	0		0	
11/18/13 10:32	0	6.67	76.89	0		0	
<b>Total</b>	<b>0.9</b>			<b>Total (lbs)</b>	<b>23,975</b>		<b>920</b>
				<b>Total H2S (lbs)</b>	<b>255</b>		

**Appendix 6b – Flare Incident – GOHT Flare  
November 21, 2013**



## Flaring Event or SRP Event RCFA Investigation Report Template

Event Type Threshold Exceedance (See E00XX for more detail)

### Flare Event

- ☒ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period
- ☒ 500,000 standard cubic feet (scf) above the baseline in any 24 hour period [for South Flare and GOHT Flare Only]
- ☐ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period due to Acid Gas or Sour Water Stripper Gas Flaring

### Sulfur Recovery Plant

- ☐ 250 ppm SO<sub>2</sub> limit exceedances, if the SO<sub>2</sub> discharge to the atmosphere is 500 lbs greater than the amount that would have been emitted if the emission limits have been met.

40 CFR 60.108a(c)(6)(ix):

Flare or SRP TGU: **GOHT, UIU, VRU, 4 UF Flares**

App D.54.a. / 40 CFR 60.108a(c)(6)(ii):

### GOHT Flare Event 1

Start Date and Time of Event: **11/21/2013 2028 hrs**

End Date and Time of Event: **11/21/2013 2223 hrs**

### 4 UF Flare Event 2

Start Date and Time of Event: **11/21/2013 2045 hrs**

End Date and Time of Event: **11/21/2013 2237 hrs**

### UIU Flare Event 3

Start Date and Time of Event: **11/21/2013 2107 hrs**

End Date and Time of Event: **11/21/2013 2230 hrs**

### VRU Flare Event 4

Start Date and Time of Event: **11/21/2013 2107 hrs**

End Date and Time of Event: **11/21/2013 2230 hrs**

App D.54.b. / 40 CFR 60.108a(c)(6)(iii)-(vii)



**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
**Document Review Date:** 04/03/13  
**Document Revision Date:** 04/03/13  
**Document Revision #** 0

Volume of Gas Flared or (if SRP Tail Gas Incident) Combusted:

	Total	Over applicable limit
Total Volume of Gas Flared	<b>3.93 MMSCFH</b>	
Quantity of SO2 Emitted:	<b>9,018.94 LBS</b>	<b>8,518.94 LBS</b>
Quantity of H2S Emitted: (assume 98% conversion to SO2)	<b>95.88 LBS</b>	<b>0 LBS</b>
Quantity of VOC Emitted:	<b>897.5 LBS</b>	<b>0 LBS</b>

Include details and assumptions used in the calculation including volumes and pollutant concentrations of gas (measured concentrations of total sulfur, H2S, or SO2 as appropriate). Use additional space as necessary.



K:\HSE\  
Environmental\Reed\



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Environmental\Reed\



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App D.54.c. / 40 CFR 60.108a(c)(6)(viii)

Identify the steps taken to limit the duration of the event, the volume of gas flared or combusted, and the quantity of SO2 and VOC emissions.

**Gas Oil Hydrotreating: Executed emergency shutdown procedures to safely depressure units. The unit feed was stopped, tripping close the feed chop valve EBV-29103 and tripping furnace burners on low oil flow. The K902 & K901 compressors were stopped. Flaring stopped at 2223 hrs.**

**Cat Feed Unit: Executed steps to cut back hydrogen flow from Praxair and increase hydrogen consumption in other units to redistribute the increased load. Flaring stopped at 2237 hrs**

**Vapor Recovery Unit 300: Immediately drop the level in the K-340 KO Drum, and the K-340 Compressor was re-started. The flaring event stopped at 2230 hrs.**



App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Identification of the process unit/s involved in causing, or suspected of having caused, the event. (Use additional space as necessary.)

**The process unit involved in causing the flaring event was the Gas Oil Hydrotreating (GOHT) unit. Due to upset conditions at the GOHT, two refinery headers/systems were impacted that resulted in the flaring from four (4) flares.**

App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Describe in detail the cause and the circumstances that lead to the event. (Use additional space as necessary.)

**GOHT Flaring Event 1: During liquid carryover of Drum D-916 and emergency shutdown flaring occurred.**

**At 2022 hrs on November 21, 2013, the instrument air supply to HCV29218 was lost; the air line broke causing the level control valve to fail in the closed position. This failure resulted in the carryover of liquids to multiple vessels and triggered the execution of the GOHT's Emergency Shutdown procedure. During the event and emergency shutdown the following occurred:**

- Liquid carryover to D-916 Drum resulted in two (2) of four (4) Relief Valves (RV) lifting to the flare
- The emergency depressure valve XZV-403 opened, resulting in a flow to flare for approximately 90 minutes.
- Feed to GOHT was stopped, which stopped consumption of hydrogen and caused more hydrogen to spill into "A" and "C" Hydrogen headers. Higher flow into "A" and "C" Hydrogen headers caused the headers to overpressure.
- The D-911 Hot Feed Drum overfilled, and sent liquid to K-340 KO Drum at the VRU 300, which tripped the compressor. Without the compressor, the Wet Gas system pressured up. The over pressuring of the Refinery Hydrogen and Wet Gas headers created a chain reaction of events that resulted in the flaring of multiple flares.

(See below for subsequent flaring events.)

**4 UF Flaring Event 2: C-804 CF-3 RV lifted when "A" Header (Hydrogen) pressure exceeded 155 psig due to over pressuring and increased hydrogen flow.**

- At 2045 hrs on November 21, 2013, the "A" Header (Hydrogen) over pressured due to an increase in flow of hydrogen from approximately 200 MSCF to 400 MSCF with spikes at 836 MSCF causing the Cat Feed Unit (CFU) CF-3 Relief Valve (RV) on the C-804 Drum to lift intermittently. The RV lifted 14 times for approximately one (1) minute each over the course of two (2) hours. The flaring event stopped at 2237 hrs.

**UIU Flaring Event 3 and VRU Flaring Event 4: Wet gas valves P53306 and P53347 to the flare opened at both VRU300 and the 11PS complex. This resulted in a flaring event at both the VRU and UIU flares.**

- At 2107 hrs on November 21, 2013, K-340 Wet Gas Compressor at VRU 300 tripped due to high level in the suction knockout drum. The high level was the result of liquid carryover and over pressuring of the Wet Gas header. K-340 was re-started and the flaring event stopped at 2230 hrs.



**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
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**Document Revision Date:** 04/03/13  
**Document Revision #** 0

40 CFR 60.108a(c)(6)(ix):

Was the discharge the result of the same root cause(s) identified in a previous analysis? If yes, describe.

**No, not related**

40 CFR 60.108a(c)(6)(xi):

Was the flaring event the result of a planned startup or shutdown of a refinery process unit or ancillary equipment connected with the flare? **No**

Was the flare management plan followed? **Yes, In this instance the loss of a water seal on D-946 Flare Drum seal shut down Flare Gas Recovery.**

App D.54.e. / 40 CFR 60.108a(c)(6)(x)

Describe the corrective measures undertaken and/or to be undertaken to avoid such an event in the future. Include schedule (including proposed commencement and completion dates) for corrective actions not completed with 45 days. If no corrective actions should be conducted, explain basis for conclusion. (Use additional space as necessary.)

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
<b>Execution of Management of Change M20134540-001:</b> Modifications to GOHT instrument air piping to replace hard piping with flexible steel hose piping on HCV29218	<b>Yes</b>		<b>12/30/2013</b>
<b>Execution of Management of Change M20134534-001:</b> Developed New D-903/D-904 Emergency Operating Procedure for total loss of Outlet Flow	<b>No</b>	<b>12/26/2013</b>	<b>01/06/2014</b>

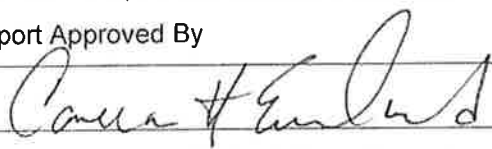
**Reported Submitted by (Investigation Team):**

**Llewellyn Reed II, Area Environmental Specialist (Team Lead)**

**Jeff Manger, Process Engineer**

**Brandon Mik, Environmental Specialist**

Report Approved By

		<b>12/31/13</b>
Cameron Eveland, Operations Area Superintendent		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in the semi-annual report due under Part VIII and in the NSPS Ja report, as applicable.

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## **Supporting Data and Calculations**

	Final WG Flow (from F29720CR) (MMscfh)	TS HI Range (%)	SO2 (lb/hr)	SO2 (lb)	VOC (lb/hr)	VOC (lb)
11/21/13 20:34	0	0	0		0	0
11/21/13 20:35	0.1	0	0		1	1
11/21/13 20:36	0.1	0	0		1	1
11/21/13 20:37	0.2	0.41	138	138	2	2
11/21/13 20:38	0.2	1.09	368	368	2	2
11/21/13 20:39	0.1	0.9	152	152	1	1
11/21/13 20:40	0.2	4.3	1,452	1,452	2	2
11/21/13 20:41	0.1	3.99	674	674	1	1
11/21/13 20:42	0.1	3.96	669	669	1	1
11/21/13 20:43	0.1	3.88	655	655	1	1
11/21/13 20:44	0.1	3.8	642	642	1	1
11/21/13 20:45	0	3.68	0		0	
11/21/13 20:46	0	3.52	0		0	
11/21/13 20:47	0	3.39	0		0	
11/21/13 20:48	0	3.3	0		0	
11/21/13 20:49	0	3.31	0		0	
11/21/13 20:50	0	3.36	0		0	
11/21/13 20:51	0	3.41	0		0	
11/21/13 20:52	0	3.41	0		0	
11/21/13 20:53	0	3.43	0		0	
11/21/13 20:54	0	3.42	0		0	
11/21/13 20:55	0	3.44	0		0	
11/21/13 20:56	0	3.45	0		0	
11/21/13 20:57	0	3.41	0		0	
11/21/13 20:58	0	3.39	0		0	
11/21/13 20:59	0	3.4	0		0	
11/21/13 21:00	0	3.46	0		0	
11/21/13 21:01	0	3.49	0		0	
11/21/13 21:02	0	3.48	0		0	
11/21/13 21:03	0	3.5	0		0	
11/21/13 21:04	0	3.47	0		0	
11/21/13 21:05	0	3.47	0		0	
11/21/13 21:06	0.3	3.48	1,763	1,763	33	33
11/21/13 21:07	0.1	3.54	598	598	18	18
11/21/13 21:08	2.8	3.02	14,279	14,279	314	314
11/21/13 21:09	5.1	1.93	16,621	16,621	601	601
11/21/13 21:10	6.4	1.52	16,427	16,427	745	745
11/21/13 21:11	6.9	1.46	17,012	17,012	804	804
11/21/13 21:12	7.1	1.44	17,265	17,265	847	847
11/21/13 21:13	7.1	1.42	17,025	17,025	860	860
11/21/13 21:14	6.8	1.44	16,535	16,535	826	826
11/21/13 21:15	6.6	1.45	16,160	16,160	796	796
11/21/13 21:16	6.3	1.43	15,213	15,213	760	760
11/21/13 21:17	5.9	1.47	14,646	14,646	713	713
11/21/13 21:18	5.6	1.46	13,806	13,806	681	681
11/21/13 21:19	5.4	1.47	13,405	13,405	655	655
11/21/13 21:20	5.5	1.5	13,931	13,931	53	53
11/21/13 21:21	5.5	1.5	13,931	13,931	53	53
11/21/13 21:22	5.5	1.5	13,931	13,931	54	54
11/21/13 21:23	5.4	1.5	13,678	13,678	52	52
11/21/13 21:24	4.9	1.5	12,412	12,412	48	48
11/21/13 21:25	4.4	1.5	11,145	11,145	43	43
11/21/13 21:26	3.8	1.52	9,754	9,754	37	37
11/21/13 21:27	3.2	1.53	8,268	8,268	36	36
11/21/13 21:28	2.8	1.52	7,187	7,187	40	40
11/21/13 21:29	2.5	1.53	6,459	6,459	36	36

11/21/13 21:30	2.4	1.53	6,201	6,201	35	35
11/21/13 21:31	2.4	1.55	6,282	6,282	35	35
11/21/13 21:32	2.6	1.56	6,849	6,849	38	38
11/21/13 21:33	2.8	1.56	7,376	7,376	40	40
11/21/13 21:34	2.8	1.58	7,471	7,471	41	41
11/21/13 21:35	2.8	1.59	7,518	7,518	40	40
11/21/13 21:36	2.8	1.58	7,471	7,471	39	39
11/21/13 21:37	2.6	1.6	7,025	7,025	38	38
11/21/13 21:38	2.4	1.6	6,484	6,484	34	34
11/21/13 21:39	2	1.6	5,404	5,404	29	29
11/21/13 21:40	1.6	1.61	4,350	4,350	23	23
11/21/13 21:41	1.4	1.62	3,830	3,830	20	20
11/21/13 21:42	1.4	1.62	3,830	3,830	20	20
11/21/13 21:43	1.4	1.64	3,877	3,877	21	21
11/21/13 21:44	1.3	1.63	3,578	3,578	20	20
11/21/13 21:45	1.3	1.65	3,622	3,622	19	19
11/21/13 21:46	1.2	1.64	3,323	3,323	17	17
11/21/13 21:47	1	1.66	2,803	2,803	15	15
11/21/13 21:48	0.9	1.66	2,523	2,523	13	13
11/21/13 21:49	0.8	1.64	2,216	2,216	11	11
11/21/13 21:50	0.7	1.63	1,927	1,927	13	13
11/21/13 21:51	0.7	1.63	1,927	1,927	14	14
11/21/13 21:52	0.8	1.68	2,270	2,270	16	16
11/21/13 21:53	0.8	1.68	2,270	2,270	16	16
11/21/13 21:54	0.8	1.68	2,270	2,270	16	16
11/21/13 21:55	0.8	1.69	2,283	2,283	15	15
11/21/13 21:56	0.6	1.66	1,682	1,682	12	12
11/21/13 21:57	0.5	1.68	1,418	1,418	9	9
11/21/13 21:58	0.4	1.67	1,128	1,128	9	9
11/21/13 21:59	0.3	1.67	846	846	8	8
11/21/13 22:00	0.2	1.68	567	567	6	6
11/21/13 22:01	0.2	1.68	567	567	5	5
11/21/13 22:02	0.2	1.67	564	564	5	5
11/21/13 22:03	0.2	1.67	564	564	5	5
11/21/13 22:04	0.2	1.66	561	561	5	5
11/21/13 22:05	0.2	1.67	564	564	7	7
11/21/13 22:06	0.4	1.7	1,148	1,148	11	11
11/21/13 22:07	0.5	1.7	1,435	1,435	13	13
11/21/13 22:08	0.6	1.73	1,753	1,753	16	16
11/21/13 22:09	0.6	1.76	1,783	1,783	16	16
11/21/13 22:10	0.6	1.74	1,763	1,763	16	16
11/21/13 22:11	0.6	1.74	1,763	1,763	16	16
11/21/13 22:12	0.6	1.74	1,763	1,763	17	17
11/21/13 22:13	0.6	1.74	1,763	1,763	20	20
11/21/13 22:14	0.6	1.73	1,753	1,753	20	20
11/21/13 22:15	0.5	1.77	1,494	1,494	17	17
11/21/13 22:16	0.5	1.92	1,621	1,621	17	17
11/21/13 22:17	0.5	1.98	1,672	1,672	17	17
11/21/13 22:18	0.5	1.92	1,621	1,621	17	17
11/21/13 22:19	0.5	1.95	1,646	1,646	17	17
11/21/13 22:20	0.5	2.05	1,731	1,731	14	14
11/21/13 22:21	0.4	2.15	1,452	1,452	9	9
11/21/13 22:22	0.3	2.23	1,130	1,130	7	7
11/21/13 22:23	0.2	2.26	763	763	5	5
11/21/13 22:24	0.1	2.29	387	387	3	3
11/21/13 22:25	0.1	2.28	385	385	3	3
11/21/13 22:26	0.1	2.28	385	385	3	3
11/21/13 22:27	0	2.25	0	0	0	0
11/21/13 22:28	0	2.28	0	0	0	0

11/21/13 22:29	0	2.27	0	0
11/21/13 22:30	0	2.25	0	0
11/21/13 22:31	0	2.28	0	0
11/21/13 22:32	0	2.28	0	0
11/21/13 22:33	0	2.28	0	0
11/21/13 22:34	0	2.29	0	0
11/21/13 22:35	0	2.27	0	0
<b>Total</b>	<b>2.9</b>		<b>Total SO2 (lbs)</b>	<b>7,648</b>
			<b>Total H2S (lbs)</b>	<b>81</b>
				<b>168</b>

# WBU EMIS Template for Release Events

## ALL RELEASE EVENTS (Complete for all release types, including flaring.)

<b>Completed By:</b>	Kelli Prenger		
<b>Event Type:</b>	Multiple (List in Event Description)	(Startup, Shutdown, Malfunction, or Maintenance)	
<b>Operating Unit:</b>	VRU300		
<b>Event Description:</b> (Equipment, Cause, and Response)	This is the total emissions from the event of K-340 tripping due to high level in the suction knockout drum. The high level was the result of a large refinery upset.		
<b>Event Start Date:</b>	11/21/2013	<b>End Date:</b>	11/21/2013
<b>Start Time:</b>	9:07 PM	<b>End Time:</b>	10:30 PM
<b>Released Material Flared?</b>	Yes	<b>KMS Number:</b>	
		<b>WARP Related?</b>	No

Chemicals Released	Lbs from Release Point (e.g. RV, Hole)	Flare Destruction Efficiency	Lbs Released to the Atmosphere	Formula	Immediately Reportable Quantity (Lbs)
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REQUIRED						Comments
Sulfur Dioxide	N/A	98%	1,366	SO <sub>2</sub>	500	
Hydrogen Sulfide	741	98%	14.83	H <sub>2</sub> S	100	
Nitrogen Oxides	N/A	98%	39.40	NO <sub>x</sub>	1,000	
Nitrogen Oxide	N/A	98%	35.46	NO	1,000	
Nitrogen Dioxide	N/A	98%	3.94	NO <sub>2</sub>	1,000	
Carbon Monoxide	138	98%	214.36	CO	N/A	
Methane	6,812	98%	136.24	CH <sub>4</sub>	N/A	
Ethylene	658	98%	13.17	C <sub>2</sub> H <sub>4</sub>	N/A	
Propylene	655	98%	13.10	C <sub>3</sub> H <sub>6</sub>	N/A	
1,3-Butadiene	0	98%	0.00	C <sub>4</sub> H <sub>6</sub>	10	
Benzene	0	98%	0.00	C <sub>6</sub> H <sub>6</sub>	10	
Cyclohexane	0	98%	0.00	C <sub>6</sub> H <sub>12</sub>	1,000	
n-Hexane	0	98%	0.00	C <sub>6</sub> H <sub>14</sub>	5,000	
Toluene	N/A	98%	0.00	C <sub>7</sub> H <sub>8</sub>	1,000	
Ethylbenzene	N/A	98%	0.00	C <sub>8</sub> H <sub>10</sub>	1,000	
Xylene (Mixed)	N/A	98%	0.00	C <sub>6</sub> H <sub>10</sub>	100	
Total Hydrocarbons (Non-Methane)	30,686	98%	613.72	-	N/A	

IF ENGINEERING ESTIMATES OR SAMPLING DATA IS AVAILABLE						Comments
Ammonia		98%	0.00	NH <sub>3</sub>	100	
Beryllium		98%	0.00	Be	10	
Carbon Disulfide		98%	0.00	CS <sub>2</sub>	100	
Carbonyl Sulfide		98%	0.00	COS	100	
Catalyst Fines		98%	0.00	-	N/A	
Lead and Lead compounds		98%	0.00	Pb	10	
Mercury and Mercury Compounds		98%	0.00	Hg	1	
Nitrate and Nitrate Compounds		98%	0.00	NO <sub>3</sub> <sup>-</sup>	N/A	
Sulfuric Acid		98%	0.00	H <sub>2</sub> SO <sub>4</sub>	1,000	
Vanadium		98%	0.00	V	N/A	
Zinc and Zinc Compounds		98%	0.00	Zn	1,000	
Methanol		98%	0.00	CH <sub>4</sub> O	5,000	
Ethylene Glycol		98%	0.00	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	5,000	
Tetrachloroethylene		98%	0.00	C <sub>2</sub> Cl <sub>4</sub>	100	
Diethanolamine		98%	0.00	C <sub>4</sub> H <sub>11</sub> NO <sub>2</sub>	100	
Cumene		98%	0.00	C <sub>9</sub> H <sub>12</sub>	5,000	
1,2,4-Trimethylbenzene		98%	0.00	C <sub>9</sub> H <sub>12</sub>	N/A	
Naphthalene		98%	0.00	C <sub>10</sub> H <sub>8</sub>	100	
Anthracene		98%	0.00	C <sub>14</sub> H <sub>10</sub>	5,000	
Phenanthrene		98%	0.00	C <sub>14</sub> H <sub>10</sub>	5,000	
Benzo(G,H,I)Perylene		98%	0.00	C <sub>22</sub> H <sub>12</sub>	5,000	

## FLARING EVENTS (Complete additional information for flaring events only.)

<b>Identify Flare:</b>	VRU100/200 & UIU		<b>Comments</b>
<b>Total event flow (Mscf):</b>	435.60		
<b>Net Heating Value (BTU/scf):</b>	1330		
<b>DATA REQUIRED IF TOTAL FLOW IS ≥ 500 Mscf:</b>			
<b>Molecular Weight:</b>			
<b>Carbon Content (wt%):</b>			

## ATTACH COPY OF ALL TOOLS, DATA, AND ASSUMPTIONS USED

Submit completed form to Environmental: [G.WHI.Environmental@bp.com](mailto:G.WHI.Environmental@bp.com)

### **Overview**

At approximately 9:07 PM on November 21st, K-340 (Wet Gas Compressor) tripped due to high level in the suction knockout drum. The high level was the result of a large refinery upset. K-340 was re-started and the flaring event stopped at 10:30 PM.

Wet gas valves to the flare opened at both VRU300 and the 11PS complex. This resulted in a flaring event at both the VRU and UIU flares.

### **Duration**

Duration was noted as the period of time that the flare control valves were open - P33608.op and/or P53306.op and/or P33477.op > 0%.

### **Volume**

Total volume released was a summation of both refinery wet gas and fuel gas via T-102 at 11B Coker.

Refinery wet gas was calculated via a volume balance for wet gas production less the wet gas consumption (via K-340). Anytime one of the flare valves was open, it was assumed that the difference in production and consumption was sent to flare.

The flow indication for fuel gas via T-102 is erratic, since it is on the low range of the scale. The rate was assumed to be 100MSCFH as it was a good average for the time that fuel gas has been in service to provide a purge of the lines for winterization.

### **Composition**

For the portion of the release that was refinery wet gas, a refinery saturated wet gas GC was used from sampling on 10/12/2013. This GC result was compared to the last three years of refinery saturated wet gas results and was in the applicable range. The composition will be conservative on H<sub>2</sub>S, as the sat and unsat lines were partially tied together at the 11PS complex when this sample was taken (leading to some higher sulfur material from 11B to be present).

For the portion of the release that was refinery fuel gas, the fuel gas analyzer was used for compositional data.

By the end of 2013, a total sulfur analyzer will be in place on the VRU Flare and UIU Flare where wet gas was routed during this event. Because the analyzers were not yet in place, and were not in place at the time of the event, the emission calculations for this event are based on H<sub>2</sub>S concentrations.

# WBU EMIS Template for Release Events

## ALL RELEASE EVENTS (Complete for all release types, including flaring.)

<b>Completed By:</b>	Devin Halliday	
<b>Event Type:</b>	Emergency Shutdown of GOHT (Startup, Shutdown, Malfunction, or Maintenance)	
<b>Operating Unit:</b>	CFU	
<b>Event Description:</b> (Equipment, Cause, and Response)	During the GOHT emergency shutdown, A header over-pressured causing CF-3 RV on C-804 to lift intermittently. It lifted 14 times for about a minute each over the course of roughly 2 hours.	
<b>Event Start Date:</b>	11/21/2013	<b>End Date:</b> 11/21/2013
<b>Start Time:</b>	8:45 PM	<b>End Time:</b> 10:37 PM
<b>Released Material Flared?</b>	Yes	<b>KMS Number:</b> <b>WARP Related?</b> No

Chemicals Released	Lbs from Release Point (e.g. RV, Hole)	Flare Destruction Efficiency	Lbs Released to the Atmosphere	Formula	Immediately Reportable Quantity (Lbs)
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REQUIRED						Comments
Sulfur Dioxide	Generally NA	N/A	4.94	SO <sub>2</sub>	500	
Hydrogen Sulfide	2.68	98%	0.05	H <sub>2</sub> S	100	
Nitrogen Oxides	Generally NA	N/A	15.61	NO <sub>x</sub>	1,000	
Nitrogen Oxide	Generally NA	N/A	14.05	NO	1,000	
Nitrogen Dioxide	Generally NA	N/A	1.56	NO <sub>2</sub>	1,000	
Carbon Monoxide	Generally NA	N/A	84.96	CO	N/A	
Methane	1,413.00	98%	28.26	CH <sub>4</sub>	N/A	
Ethylene	0.00	98%	0.00	C <sub>2</sub> H <sub>4</sub>	N/A	
Propylene	0.00	98%	0.00	C <sub>3</sub> H <sub>6</sub>	N/A	
1,3-Butadiene	0.00	98%	0.00	C <sub>4</sub> H <sub>6</sub>	10	
Benzene	0.00	98%	0.00	C <sub>6</sub> H <sub>6</sub>	10	
Cyclohexane	0.00	98%	0.00	C <sub>6</sub> H <sub>12</sub>	1,000	
n-Hexane	0.00	98%	0.00	C <sub>6</sub> H <sub>14</sub>	5,000	
Toluene	0.00	98%	0.00	C <sub>7</sub> H <sub>8</sub>	1,000	
Ethylbenzene	0.00	98%	0.00	C <sub>8</sub> H <sub>10</sub>	1,000	
Xylene (Mixed)	0.00	98%	0.00	C <sub>6</sub> H <sub>10</sub>	100	
Total Hydrocarbons (Non-Methane)	5,791.00	98%	115.82	-	N/A	

IF ENGINEERING ESTIMATES OR SAMPLING DATA IS AVAILABLE						Comments
Ammonia	1.33	98%	0.03	NH <sub>3</sub>	100	
Beryllium		N/A	0.00	Be	10	
Carbon Disulfide		98%	0.00	CS <sub>2</sub>	100	
Carbonyl Sulfide		98%	0.00	COS	100	
Catalyst Fines		N/A	0.00	-	N/A	
Lead and Lead compounds		N/A	0.00	Pb	10	
Mercury and Mercury Compounds		N/A	0.00	Hg	1	
Nitrate and Nitrate Compounds		N/A	0.00	NO <sub>3</sub> <sup>-</sup>	N/A	
Sulfuric Acid		98%	0.00	H <sub>2</sub> SO <sub>4</sub>	1,000	
Vanadium		N/A	0.00	V	N/A	
Zinc and Zinc Compounds		N/A	0.00	Zn	1,000	
Methanol		98%	0.00	CH <sub>4</sub> O	5,000	
Ethylene Glycol		98%	0.00	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	5,000	
Tetrachloroethylene		98%	0.00	C <sub>2</sub> Cl <sub>4</sub>	100	
Diethanolamine		98%	0.00	C <sub>4</sub> H <sub>11</sub> NO <sub>2</sub>	100	
Cumene		98%	0.00	C <sub>9</sub> H <sub>12</sub>	5,000	
1,2,4-Trimethylbenzene		98%	0.00	C <sub>9</sub> H <sub>12</sub>	N/A	
Naphthalene		98%	0.00	C <sub>10</sub> H <sub>8</sub>	100	
Anthracene		98%	0.00	C <sub>14</sub> H <sub>10</sub>	5,000	
Phenanthrene		98%	0.00	C <sub>14</sub> H <sub>10</sub>	5,000	
Benzo(G,H,I)Perylene		98%	0.00	C <sub>22</sub> H <sub>12</sub>	5,000	

## FLARING EVENTS (Complete additional information for flaring events only.)

<b>Identify Flare:</b>	4UF Flare	Comments
<b>Total event flow (Mscf):</b>	598	
<b>Net Heating Value (BTU/scf):</b>	384	
<b>DATA REQUIRED IF TOTAL FLOW IS ≥ 500 Mscf:</b>		
<b>Molecular Weight:</b>	4.59	
<b>Carbon Content (wt%):</b>	45.9	

**ATTACH COPY OF ALL TOOLS, DATA, AND ASSUMPTIONS USED**

Submit completed form to Environmental: [GWHI.Environmental@bp.com](mailto:GWHI.Environmental@bp.com)

**Appendix 6c – Flare Incident – South Flare  
November 24, 2013**



## Flaring Event or SRP Event RCFA Investigation Report Template

### Event Type Threshold Exceedance

#### Flare Event

- ✓ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period
- ✓ 500,000 standard cubic feet (scf) above the baseline in any 24 hour period [for South Flare and GOHT Flare Only]
- ☐ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period due to Acid Gas or Sour Water Stripper Gas Flaring

#### Sulfur Recovery Plant

- ☐ 250 ppm SO<sub>2</sub> limit exceedances, if the SO<sub>2</sub> discharge to the atmosphere is 500 lbs greater than the amount that would have been emitted if the emission limits have been met.

40 CFR 60.108a(c)(6)(ix):

Flare or SRP TGU: South Flare

App D.54.a. / 40 CFR 60.108a(c)(6)(ii):

	Overpressure in T-201/D-214	K-401 Shutdown
Start Date and Time of Event:	11/24/2013 0146	11/24/2013 0346
End Date and Time of Event:	11/24/2013 0214	11/24/2013 1703

App D.54.b. / 40 CFR 60.108a(c)(6)(iii)-(vii)

Volume of Gas Flared or (if SRP Tail Gas Incident) Combusted:

	Overpressure in T-201 and D-214	K-401 Shutdown	Total
Total Volume of Gas Flared	0.3 mmscf	19.5 mmscf	19.8 mmscf
Quantity of SO <sub>2</sub> Emitted:	5,716 lbs	259,755 lbs	265,372 lbs
Quantity of H <sub>2</sub> S Emitted:	60 lbs	1,575 lbs	1,635 lbs
Quantity of VOC Emitted:	35.2 lbs	7,552 lbs	7,587 lbs

\* Standard conditions = 60° F.

\*\* Assumes 98% H<sub>2</sub>S converted to SO<sub>2</sub>

\*\*\* Assumes 98% of VOC destroyed



### Supporting Data and Calculations

**Quantity Resulting From Event:** (Include details and assumptions used in the calculation including volumes and pollutant concentrations of gas. Use additional space as necessary.)



Nov 24 Flaring  
Calcs.docx

#### App D.54.c. / 40 CFR 60.108a(c)(6)(viii)

Identify the steps taken to limit the duration of the event, the volume of gas flared or combusted, and the quantity of SO<sub>2</sub> and VOC emissions.

Two related events occurred within a 24 Hour period, thus they are combined in this report.

Overpressure in Fractionator Tower-201 and knockout Drum-214 caused a release to the South Flare when the set point for pressure control valve PCV 34002 was overcome due to abnormal valve function. Flaring ended when pressure returned to below the set point of PCV 3002.

The second phase of the event ended when the system was normalized and compressors K-103 A/B at the Flare Gas Recovery Unit were started and K-401 could be restarted.

#### App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Identification of the process unit/s involved in causing, or suspected of having caused, the event. (Use additional space as necessary.)

Vapor Recovery Unit 400 at Coker 2 Complex.

#### App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Describe in detail the cause and the circumstances that lead to the event. (Use additional space as necessary.)

Over pressure in T-201/D-214:

Just prior to this event, feed rates were decreased to a minimum until the No. 1 Coking Module was prepared to be charged with feed. Ambient temperatures were below freezing at the time of this reduction in feed rate. When feed rates began to be increased, pressure at the wet gas compressor's (K-401) discharge pressure control valve (PCV 34006) spiked, which caused the inlet pressure control valve (PCV 34001) to begin reducing feed to the inlet of K-401. The excess K-401 feed was directed to the South Flare. The pressure increase at the discharge of K-401 was caused by a cooling of the discharge system due to a combination of low temperatures and feed rate reductions. The cooling caused abnormal functioning (sluggish operation) of the valves in the system. This led to a pressure increase at Fractionator Tower (T-201) and its Overhead Knockout Drum (D-214), ultimately opening a pressure control valve (PCV34002) to the South Flare. Once pressure stabilized, PCV 34002 shut and relief to the flare ended.



#### K-401 Shut Down:

The over-pressure in T-201/D-214 led to significant cooling and restriction of flow through the T-201 overhead condensers (E-212). This caused pressure to build in the Fractionator Tower (T-201) again. As a result, liquid formed and moved through the system to Knockout Drum (D-401). D-401 is designed to shut down the wet gas compressor (K-401) on high level. When K-401 shut down due to the high level it resulted in flaring at the South Flare. K-401 compressor remained shut down until systems could be evaluated, temperatures could be normalized, and the unit could be brought safely on line. The decision was made to continue Coking operations at reduced rates during the K-401 outage to ensure a safe operating mode could be managed until K-401 was ready for startup. If the Coking operation had been halted during the outage, it could have caused more significant process safety issues and equipment damage. Incomplete coking can lead to a tarry drum which is difficult to cool during the quench step and can lead to a unit fire.

#### 40 CFR 60.108a(c)(6)(ix):

Was the discharge the result of the same root cause(s) identified in a previous analysis? If yes, describe.  
No.

#### 40 CFR 60.108a(c)(6)(xi):

Was the flaring event the result of a planned startup or shutdown of a refinery process unit or ancillary equipment connected with the flare?

Yes. Startup of the Coker 2 Complex.

Was the flare management plan followed?

Yes. In this instance the loss of a water seal on D-102 Flare Drum seal shut down Flare Gas Recovery.

#### App D.54.e. / 40 CFR 60.108a(c)(6)(x)

Describe the corrective measures undertaken and/or to be undertaken to avoid such an event in the future. Include schedule (including proposed commencement and completion dates) for corrective actions not completed with 45 days. If no corrective actions should be conducted, explain basis for conclusion. (Use additional space as necessary.)

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
Start and stop fans and warm up lines during Winter weather. To maintain temperatures cycle the 12 fans manually while program is built to automatically control this process.	Yes – 11/25		



**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
**Document Review Date:** 04/03/13  
**Document Revision Date:** 04/03/13  
**Document Revision #** 0

Tarp fans to prevent freeze ups.	Yes – 12/2		
MOC M20134443-001 initiated to have fin fans auto cycling programmed.	No	12/14/2013	3/31/2014
MOC M20134447-001 initiated to install thermocouples on each E212 outlet to more accurately determine temperatures.	No	12/14/2013 and equipment ordered.	Install by January 31, 2014

**Report Submitted by (Investigation Team):**

Jim Madison, Area Environmental Specialist (Team Lead)

Roy Mize, Process Engineering Superintendent

Jenny Thakkar, Process Engineer

Sheila Sorrentino, Compliance Assurance Specialist

**Report Approved By:**

		12/26/13
Jon Bortscheller, Operations Superintendent		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in the semi-annual report due under Part VIII and in the NSPS Ja report, as applicable.

## **Supporting Data and Calculations**

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**From:** Thakkar, Jenny  
**Sent:** Friday, December 06, 2013 3:31 PM  
**To:** Bortscheller, Jonathan M; Ross, Ken B  
**Subject:** Flare Calculations for November 24th

Ken and Jon,

I've reviewed the calculations and the data from the South Flare during the November 24<sup>th</sup> event. The total release was:

<b>Total Release:</b>	19.8	mmscf
	265,372	lbs SO2
	1635	lbs H2S
	7,587	lbs VOC

For this release, I used the following assumptions:

- The connection to the alky flare was open until 9:09 AM. During this time, the flow meter at the south flare would not be representative. In its place, I used the CV data for the pressure control valve to the flare to calculate the flare flow rate. This method was used until 8:13 AM. At this point, the output on the controller began to exceed 50% and the calculated value exceeded design information. For the time between 8:14 AM and 9:08 AM, the average of the last and next good value was used for the flow.
- Since the flow meter was not accurate, the pounds of sulfur and pounds of VOC data from DAHS could not be used. The %sulfur and the % of the non-VOC components were used to calculate the pounds of sulfur and pounds of VOC.
- During the release, the sulfur analyzer went through its daily calibration. During that time, the average of the last good and the next good value was used per environmental recommendation.
- H2S analyzer went to 0, so per the environmental group, we used the total sulfur number and assumed a 98% flare destruction efficiency, so 2% left the flare as H2S.
- Post 9:08 AM, the data from DAHS was used directly.



Please let me know if you have any questions.

Thanks,

**Jenny Thakkar**

Crude and Coking Process Engineer

Work: 219.473.1332

Radio#: 635

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	Final WG Flow (from F33651CR)	Calculated Flare Flow	TS HI Range	WG VOC	SO2	SO2	VOC	VOC	P34002.OP K-401 Suc Pr Rel To Flare	P34001 1st Stage Frac Ovhd Press	P36780 Flare gas to South flare	Calculat d CV
	(MMscfh)	MMSCFH	(%)	(%)	(lb/hr)	(lb)	(lb/hr)	(lb)	%	PSIG	PSIG	
11/24/13 1:46	0.1	0.300038473	0.09	0.04	46	46	4.49072304	4.5	3.28484416	14.39476	1.138435	267.985
11/24/13 1:47	0.4	0.303652598	0.14	0.04	72	72	4.65014498	4.7	3.24874711	14.86072	0.984274	265.094
11/24/13 1:48	0.6	0.362215078	0.25	0.04	153	153	5.67052146	5.7	3.79740739	15.36771	0.832682	308.902
11/24/13 1:49	0.6	0	0.59	0.04	0		0		0	13.47584	0.896654	
11/24/13 1:50	0.6	0	2.09	0.04	0		0		0	11.4137	0.767412	
11/24/13 1:51	0.5	0	4.03	0.04	0		0		0	14.16499	0.538753	
11/24/13 1:52	0.2	1.901240486	7.28	0.04	23,373	23,373	32.4021121	32.4	22.7382164	15.28901	1.263436	1650.6
11/24/13 1:53	0.1	1.908345905	9.66	0.04	31,130	31,130	33.1851613	33.2	23.964777	15.18542	2.261735	1726.14
11/24/13 1:54	0.1	1.923551947	10.7	1.8	34,756	34,756	34.116816	34.1	24.3717422	15.08183	2.318412	1750.87
11/24/13 1:55	0.1	1.896191755	11.28	3.55	36,119	36,119	34.2892831	34.3	23.8384972	14.97824	2.101715	1718.43
11/24/13 1:56	0.1	1.856843608	11.49	3.55	36,028	36,028	34.2218314	34.2	23.105814	14.90613	1.885019	1673.44
11/24/13 1:57	0.1	1.820541919	11.49	3.55	35,323	35,323	34.1842851	34.2	22.3731327	14.89467	1.688322	1627.9
11/24/13 1:58	0.2	0.716256858	11.54	3.55	13,958	13,958	13.6975932	13.7	8.61366272	13.09483	1.451625	681.517
11/24/13 1:59	0.1	0.086514332	11.63	3.55	1,699	1,699	1.68449722	1.7	1.16822517	9.317309	1.234928	96.44
11/24/13 2:00	0.1	0	12.22	3.55	0		0		0	8.66852	1.018232	
11/24/13 2:01	0	0	12.9	3.55	0		0		0	10.26135	0.801535	
11/24/13 2:02	0	0	13.03	20.92	0		0		0	13.44908	0.599285	
11/24/13 2:03	0.1	1.354480407	12.92	24.4	29,551	29,551	165.328828	165.3	15.3350935	15.29932	1.025572	1165
11/24/13 2:04	0.1	1.690983544	12.9	24.4	36,836	36,836	206.994468	207.0	21.1782875	14.22641	1.68556	1552
11/24/13 2:05	0	0.502165532	12.99	24.4	11,015	11,015	61.6461848	61.6	7.24295425	9.242756	1.665184	577.652
11/24/13 2:06	0	0	12.92	24.4	0		0		0	8.097089	1.412117	
11/24/13 2:07	0	0	12.85	24.4	0		0		0	7.153594	1.15047	
11/24/13 2:08	0	0	12.89	24.4	0		0		0	9.597502	0.893113	
11/24/13 2:09	0	0	12.9	24.73	0		0		0	12.98926	0.640046	
11/24/13 2:10	0	1.750781814	12.56	26.37	37,133	37,133	1116.03304	1,116.0	20.9918976	14.53575	0.881313	1540.84
11/24/13 2:11	0	0.514162243	11.32	26.37	9,829	9,829	327.991137	328.0	7.44953346	8.725567	1.302041	593.417
11/24/13 2:12	0	0	10.41	26.37	0		0		0	7.613969	1.27528	
11/24/13 2:13	0	0	9.96	26.37	0		0		0	6.585374	1.095695	
11/24/13 2:14	0	0	9.91	26.37	0		0		0	5.747655	0.913067	
Total		0.3				5,617		35.2				

60

Total Release:	19.8	mmscf
	265,372	lbs SO2
	1635	lbs H2S
	7,587	lbs VOC

	Final WG Flow (from F33851CR) (MMscfh)	Calculated Flare Flow		TS HI Range (%)	WG VOC (%)	SO2 (lb/hr)	SO2 (lb)	VOC (lb/hr)	VOC (lb)	P34002 OP		1st Stage	P34001		P38780	
		MMSCFH								K-401 Suc Pr Rel To Flare	%	Frac Ovhd Press PSIG	Flare gas to South flare	PSIG	Calculated CV	
11/24/13 3:46	0.5	0	0.98	1.16	0	0	0	0	0	0	5.631471	0.143349				
11/24/13 3:47	0.6	0	4.09	1.16	0	0	0	0	0	0	5.733096	0.141415				
11/24/13 3:48	0.6	0	7.93	1.16	0	0	0	0	0	0	5.58826	0.139481				
11/24/13 3:49	0.6	0	7.89	1.16	0	0	0	0	0	0	5.509896	0.137547				
11/24/13 3:50	0.6	0	7.45	1.34	0	0	0	0	0	0	5.52086	0.135613				
11/24/13 3:51	0.7	2.939062777	8.31	1.37	41,243	41,243	179	179	42.9754562	12.86397	0.55199	2717.99				
11/24/13 3:52	0.7	3.216284159	9.81	1.37	53,280	53,280	194	194	48.7883034	14.58906	2.056447	2954.8				
11/24/13 3:53	0.7	2.51076817	10.94	1.37	46,384	46,384	150	150	35.9134445	14.12856	2.446476	2388.53				
11/24/13 3:54	0.7	2.289059685	11.46	1.37	44,298	44,298	135	135	31.1341362	14.44081	2.334001	2139.41				
11/24/13 3:55	0.8	2.259255959	11.63	1.37	44,370	44,370	132	132	29.9807415	14.74785	2.223402	2076.13				
11/24/13 3:56	0.8	2.214816613	11.69	1.37	43,717	43,717	128	128	28.8077984	14.94283	2.110927	2010.51				
11/24/13 3:57	0.7	2.150263225	11.74	4.83	42,629	42,629	123	123	27.6348534	14.94234	1.998453	1943.63				
11/24/13 3:58	0.7	2.086970173	11.77	22.13	41,479	41,479	118	118	26.5080242	14.94185	1.884104	1878.18				
11/24/13 3:59	0.7	2.059142517	11.81	22.13	41,065	41,065	115	115	25.9506626	14.94137	1.773504	1845.37				
11/24/13 4:00	0.7	2.024504831	11.85	22.13	40,511	40,511	112	112	25.3838539	14.94089	1.734943	1811.71				
11/24/13 4:01	0.7	1.987960692	11.88	22.13	39,881	39,881	108	108	24.8170433	14.9404	1.715832	1777.75				
11/24/13 4:02	0.7	1.951030098	11.98	22.13	39,469	39,469	105	105	24.2502346	14.93992	1.696722	1743.50				
11/24/13 4:03	0.7	1.913712087	12.03	22.13	38,876	38,876	102	102	23.683424	14.93944	1.677611	1708.95				
11/24/13 4:04	0.7	1.876006286	12.08	22.13	38,269	38,269	99	99	23.1166153	14.93895	1.6585	1674.10				
11/24/13 4:05	0.7	1.83940343	12.16	27.3	37,750	37,750	722	722	22.5568466	14.93847	1.63939	1639.40				
11/24/13 4:06	0.7	1.859076691	12.16	32.48	38,174	38,174	1,096	1,096	22.8349133	14.93798	1.620279	1656.67				
11/24/13 4:07	0.7	1.876154	12.18	32.48	38,588	38,588	1,106	1,106	22.061594	14.93781	1.601169	1670.7				
11/24/13 4:08	0.7	1.858685504	12.15	32.48	38,135	38,135	1,096	1,096	22.7790947	14.94988	1.582058	1653.21				
11/24/13 4:09	0.7	1.841085003	12.12	32.48	37,681	37,681	1,086	1,086	22.4965973	14.96194	1.562947	1635.6				
11/24/13 4:10	0.6	1.823353328	12.04	32.48	37,071	37,071	1,075	1,075	22.214098	14.97401	1.543837	1618.0				
11/24/13 4:11	0.6	1.805490077	11.93	32.48	36,373	36,373	1,085	1,065	21.9315987	14.98808	1.524726	1600.29				
11/24/13 4:12	0.7	1.787494917	11.78	32.48	35,557	35,557	1,341	1,341	21.6490993	14.99814	1.505615	1582.50				
11/24/13 4:13	0.7	1.789367896	11.59	29.94	34,629	34,629	1,493	1,493	21.3666019	15.01021	1.486505	1564.84				
11/24/13 4:14	0.6	1.751108445	11.4	29.43	33,710	33,710	1,479	1,479	21.0841026	15.02228	1.467394	1546.71				
11/24/13 4:15	0.7	1.732716465	11.19	29.43	32,741	32,741	1,464	1,464	20.8016033	15.03434	1.448824	1528.70				
11/24/13 4:16	0.7	1.714191845	11.04	29.43	31,957	31,957	1,450	1,450	20.519104	15.04641	1.429173	1510.6				
11/24/13 4:17	0.7	1.695256906	10.88	29.43	31,146	31,146	1,435	1,435	20.2418213	15.04798	1.410062	1492.79				
11/24/13 4:18	0.7	1.721305443	10.73	29.43	31,189	31,189	1,458	1,458	20.5850868	15.04488	1.390952	1514.8				
11/24/13 4:19	0.6	1.747259801	10.58	29.43	31,216	31,216	1,482	1,482	20.9283543	15.04178	1.371841	1536.79				
11/24/13 4:20	0.6	1.773117157	10.48	29.43	31,379	31,379	1,434	1,434	21.2716198	15.03867	1.352731	1558.62				
11/24/13 4:21	0.6	1.798879903	10.37	27.06	31,501	31,501	1,417	1,417	21.6148872	15.03557	1.33362	1580.34				
11/24/13 4:22	0.6	1.821978892	10.06	27.06	30,951	30,951	1,437	1,437	21.9222393	15.03247	1.31451	1599.70				
11/24/13 4:23	0.5	1.844460414	9.84	27.06	30,648	30,648	1,456	1,456	22.2222805	15.02942	1.295717	1618.52				
11/24/13 4:24	0.4	1.872365596	9.96	27.06	31,491	31,491	1,480	1,480	22.5375805	15.08969	1.27597	1638.20				
11/24/13 4:25	0	1.887319977	10.08	27.06	32,125	32,125	1,493	1,493	22.8238144	14.99324	1.258859	1655.99				
11/24/13 4:26	0.7	1.858780515	10.1	27.06	31,702	31,702	1,472	1,472	22.3732338	15.02439	1.237749	1627.95				
11/24/13 4:27	0.7	1.833651329	10.09	27.06	31,243	31,243	1,454	1,454	21.916144	15.11938	1.218319	1599.26				
11/24/13 4:28	0.7	1.891440891	10.09	26.83	32,227	32,227	1,422	1,422	22.9037647	15.0403	1.326514	1680.94				
11/24/13 4:29	0.7	1.952317073	9.96	26.38	32,836	32,836	1,427	1,427	23.9735661	15.02497	1.505306	1726.67				
11/24/13 4:30	0.7	1.97120171	9.71	26.38	32,321	32,321	1,441	1,441	24.3363991	15.12009	1.684097	1748.7				
11/24/13 4:31	0.7	1.982796713	9.64	26.38	32,277	32,277	1,449	1,449	24.6554394	15.16182	1.682888	1768.02				
11/24/13 4:32	0.7	2.020557264	9.53	26.38	32,517	32,517	1,476	1,476	24.9744797	15.07393	1.557623	1787.21				
11/24/13 4:33	0.7	2.046966281	9.47	26.38	32,734	32,734	1,496	1,496	25.2173424	15.01475	1.365335	1801.76				
11/24/13 4:34	0.7	2.063146277	9.42	26.38	32,819	32,819	1,507	1,507	25.4683399	15.02687	1.38867	1816.74				
11/24/13 4:35	0.7	2.078982903	9.4	26.38	33,000	33,000	1,518	1,518	25.7152214	15.0388	1.411623	1831.42				
11/24/13 4:36	0.7	2.09474246	9.38	26.5	33,180	33,180	1,530	1,530	25.9621048	15.05072	1.434575	1846.04				
11/24/13 4:37	0.7	2.109882228	9.14	26.56	32,565	32,565	1,540	1,540	26.2048721	15.05898	1.457146	1860.37				
11/24/13 4:38	0.7	2.125186202	8.98	26.56	32,227	32,227	1,551	1,551	26.4599857	15.06082	1.480863	1875.36				
11/24/13 4:39	0.7	2.139894483	9.08	26.56	32,811	32,811	1,562	1,562	26.7086872	15.0626	1.503816	1889.81				
11/24/13 4:40	0.6	2.144529304	9.16	26.56	33,172	33,172	1,585	1,585	26.8106003	15.05793	1.527151	1895.87				
11/24/13 4:41	0.6	2.147257992	9.2	26.56	33,359	33,359	1,567	1,567	26.9022617	15.03903	1.549721	1901.21				
11/24/13 4:42	0.6	2.1500006	9.26	26.56	33,619	33,619	1,588	1,588	26.9954777	15.0198	1.572674	1906.83				
11/24/13 4:43	0.6	2.153362273	9.28	26.56	33,745	33,745	1,571	1,571	27.0888917	15.00862	1.595627	1912.05				
11/24/13 4:44	0.2	2.158284946	9.31	27.03	33,931	33,931	1,574	1,574	27.1819077	15.01697	1.618579	1917.48				
11/24/13 4:45	0.5	2.163191383	9.33	27.03	34,081	34,081	1,577	1,577	27.2751217	15.02533	1.641532	1922.68				
11/24/13 4:46	0.8	2.168801839	9.26	27.03	33,902	33,902	1,581	1,581	27.3683376	15.03369	1.664485	1928.25				
11/24/13 4:47	0.8	2.172956078	9.24	27.03	33,905	33,905	1,584	1,584	27.4615517	15.04204	1.687437	1933.64				
11/24/13 4:48	0.8	2.174251659	9.12	27.03	33,485	33,485	1,584	1,584	27.5516605	15.05012	1.751262	1938.84				
11/24/13 4:49	0.7	2.173074234	8.81	27.03	32,329	32,329	1,583	1,583	27.6495361	15.05472	1.84723	1944.47				
11/24/13 4:50	0.8	2.186605222	8.82	27.03	32,567	32,567	1,593	1,593	27.980011	15.05247	1.937104	1963.44				
11/24/13 4:51	0.8	2.256688737	8.9	27.25	33,916	33,916	1,646	1,646	28.332613	15.05015	1.362616	1983.57				
11/24/13 4:52	0.8	2.303511682	8.86	28.35	34,464	34,464	1,684	1,684	28.6794357	15.04786	1.065332	2003.26				
11/24/13 4:53	0.8	2.323569338	8.79	28.35	34,489	34,489	1,703	1,703	29.0262585	15.04557	1.092469	2022.83				
11/24/13 4:54	0.8	2.343119595	8.78	28.35	34,740	34,740	1,721	1,721	29.3673	15.04332	1.119154	2041.97				
11/24/13 4:55	0.8	2.362837866	8.74	28.35	34,873	34,873	1,739	1,739	29.7141228	15.04118	1.146291	2061.3				
11/24/13 4:56	0.9	2.381273371	8.73	28.35	35,105	35,105	1,757	1,757	30.04							

11/24/13 5:13	0.9	2.693703427	8.43	28.92	38,346	38,346	2,095	2,095	34.1956673	15.01894	0.531358	2301.42
11/24/13 5:14	0.8	2.666652862	8.39	29.1	37,781	37,781	2,128	2,128	33.7589073	15.02856	0.547789	2278.84
11/24/13 5:15	0.9	2.677647025	8.3	29.97	37,529	37,529	2,168	2,168	33.9504662	15.03817	0.564223	2288.76
11/24/13 5:16	0.9	2.690864382	8.33	29.97	37,851	37,851	2,176	2,176	34.1809464	15.04695	0.580657	2300.66
11/24/13 5:17	0.9	2.702213371	8.33	29.97	38,011	38,011	2,183	2,183	34.4114304	15.03866	0.597091	2312.51
11/24/13 5:18	0.9	2.713477112	8.33	29.97	38,169	38,169	2,190	2,190	34.6419106	15.02837	0.613524	2324.31
11/24/13 5:19	0.9	2.724856178	8.33	29.97	38,326	38,326	2,197	2,197	34.8723946	15.01608	0.629958	2336.06
11/24/13 5:20	0.9	2.734974838	8.33	29.97	38,471	38,471	2,203	2,203	35.1028748	14.99773	0.646392	2347.76
11/24/13 5:21	0.9	2.727182101	8.33	29.97	38,362	38,362	2,195	2,195	35.3333588	14.79318	0.662826	2359.4
11/24/13 5:22	0.9	2.849220503	8.33	30.05	40,079	40,079	2,346	2,346	36.9183769	15.11895	0.67926	2438.22
11/24/13 5:23	0.8	2.83992779	8.33	30.2	39,948	39,948	2,371	2,371	36.8718605	15.06884	0.695693	2435.94
11/24/13 5:24	0.8	2.798125566	8.33	30.2	39,360	39,360	2,338	2,338	36.2867661	15.00239	0.712127	2407.10
11/24/13 5:25	0.8	2.762965766	8.33	30.2	38,866	38,866	2,311	2,311	35.7016678	15.00596	0.728561	2377.93
11/24/13 5:26	0.8	2.728330047	8.33	30.2	38,378	38,378	2,284	2,284	35.1165733	15.01805	0.744995	2348.48
11/24/13 5:27	0.8	2.741020917	8.33	30.2	38,557	38,557	2,297	2,297	35.3395882	15.03013	0.761429	2359.73
11/24/13 5:28	0.8	2.773011359	8.33	30.2	39,007	39,007	2,326	2,326	35.8953552	15.04221	0.777862	2387.62
11/24/13 5:29	0.8	2.779947187	8.33	30.2	39,104	39,104	2,334	2,334	36.0221901	15.0543	0.794296	2393.95
11/24/13 5:30	0.8	2.775810857	8.33	31.07	39,046	39,046	2,332	2,332	35.9578133	15.06838	0.81073	2390.74
11/24/13 5:31	0.8	2.771671549	8.33	31.51	38,988	38,988	2,331	2,331	35.8934364	15.07846	0.827164	2387.53
11/24/13 5:32	0.7	2.808495743	8.33	31.51	39,506	39,506	2,364	2,364	36.5395699	15.09034	0.843324	2419.60
11/24/13 5:33	0.7	2.799563955	8.33	31.51	39,380	39,380	2,359	2,359	36.4905891	15.04543	0.860031	2417.18
11/24/13 5:34	0.7	2.761113901	8.33	31.51	38,839	38,839	2,328	2,328	35.9650726	14.97791	0.876191	2391.10
11/24/13 5:35	0.7	2.727171793	8.33	31.51	38,361	38,361	2,302	2,302	35.4306526	14.96279	0.892625	2364.32
11/24/13 5:36	0.7	2.695191739	8.33	31.51	37,912	37,912	2,277	2,277	34.8962326	14.97153	0.909059	2337.27
11/24/13 5:37	0.7	2.662438802	8.33	31.51	37,451	37,451	2,298	2,298	34.3529053	14.98042	0.925767	2309.5
11/24/13 5:38	0.7	2.62993343	8.33	30.98	36,994	36,994	2,299	2,299	33.8184853	14.98917	0.9422	2281.93
11/24/13 5:39	0.7	2.609988269	8.33	30.98	36,713	36,713	2,283	2,283	33.5111694	14.98888	0.95836	2265.95
11/24/13 5:40	0.7	2.597954735	8.33	30.98	36,544	36,544	2,275	2,275	33.3455353	14.98301	0.974794	2257.30
11/24/13 5:41	0.7	2.585906713	8.33	30.98	36,375	36,375	2,267	2,267	33.1799049	14.97714	0.991228	2248.63
11/24/13 5:42	0.7	2.573843731	8.36	30.98	36,335	36,335	2,259	2,259	33.0142708	14.97127	1.007662	2239.93
11/24/13 5:43	0.7	2.56176635	8.24	30.98	35,646	35,646	2,250	2,250	32.8486404	14.96564	1.024095	2231.20
11/24/13 5:44	0.7	2.54967417	8.2	30.98	35,305	35,305	2,242	2,242	32.8830063	14.95953	1.040529	2222.45
11/24/13 5:45	0.7	2.572426505	8.2	30.92	35,620	35,620	2,264	2,264	32.9397736	15.05335	1.056963	2236.01
11/24/13 5:46	0.7	2.616851414	8.21	30.81	36,277	36,277	2,305	2,305	33.6050949	15.11357	1.073397	2270.84
11/24/13 5:47	0.6	2.621445124	8.22	30.81	36,388	36,388	2,312	2,312	33.7929039	15.06178	1.089831	2280.60
11/24/13 5:48	0	2.598645825	8.25	30.81	36,203	36,203	2,294	2,294	33.5188589	15.00998	1.106264	2266.35
11/24/13 5:49	0	2.575839994	8.25	30.81	35,885	35,885	2,276	2,276	33.2448196	14.95819	1.122698	2252.03
11/24/13 5:50	0	2.58413008	8.24	30.81	35,679	35,679	2,268	2,268	33.1088028	14.93655	1.139132	2244.
11/24/13 5:51	0	2.563995095	8.23	30.81	35,633	35,633	2,270	2,270	33.1062851	14.95303	1.155566	2244.76
11/24/13 5:52	0	2.563860856	8.21	30.81	35,545	35,545	2,272	2,272	33.1037674	14.96951	1.171999	2244.63
11/24/13 5:53	0	2.563727371	8.2	30.64	35,500	35,500	2,274	2,274	33.1012497	14.98599	1.188433	2244.50
11/24/13 5:54	0	2.563504066	8.16	30.47	35,325	35,325	2,276	2,276	33.0986519	15.00302	1.205415	2244.36
11/24/13 5:55	0	2.563462893	8.14	30.47	35,236	35,236	2,278	2,278	33.0962181	15.01895	1.221301	2244.2
11/24/13 5:56	0	2.563327292	7.9	30.47	34,196	34,196	2,280	2,280	33.0936165	15.03598	1.238282	2244.10
11/24/13 5:57	0	2.563196833	7.8	30.47	33,761	33,761	2,282	2,282	33.0910988	15.05246	1.254716	2243.97
11/24/13 5:58	0	2.563069266	7.88	30.47	34,106	34,106	2,284	2,284	33.088623	15.06867	1.270876	2243.84
11/24/13 5:59	0	2.481942787	7.98	30.47	33,445	33,445	2,214	2,214	31.8048916	15.04942	1.28731	2175.6
11/24/13 6:00	0	2.315880547	8.06	30.47	31,520	31,520	2,068	2,068	29.321249	14.94165	1.304018	2039.39
11/24/13 6:01	0	2.147624136	8.13	30.5	29,484	29,484	1,920	1,920	26.8783226	14.83564	1.320451	1899.81
11/24/13 6:02	0	1.976989044	8.21	30.51	27,409	27,409	1,769	1,769	24.353943	14.76229	1.336885	1754.72
11/24/13 6:03	0	1.8089836249	8.25	30.51	25,200	25,200	1,620	1,620	21.9924679	14.80138	1.353319	1604.11
11/24/13 6:04	0	1.670918412	8.28	30.51	23,363	23,363	1,498	1,498	20.0522709	14.83982	1.369479	1480.57
11/24/13 6:05	0	1.548074003	8.3	30.51	21,698	21,698	1,389	1,389	18.3688202	14.87891	1.385913	1370.56
11/24/13 6:06	0	1.422060243	8.37	30.51	20,099	20,099	1,277	1,277	16.8853695	14.918	1.402346	1257.93
11/24/13 6:07	0	1.349036211	8.39	30.51	19,113	19,113	1,213	1,213	15.7221155	14.95775	1.419054	1192.30
11/24/13 6:08	0	1.326677927	8.43	30.27	18,886	18,886	1,193	1,193	15.4200592	14.99884	1.435488	1171.55
11/24/13 6:09	0	1.304401939	8.44	29.08	18,591	18,591	1,173	1,173	15.1230364	15.03199	1.451648	1151.08
11/24/13 6:10	0	1.278018954	8.5	29.08	18,344	18,344	1,149	1,149	14.8209791	14.99216	1.468082	1130.14
11/24/13 6:11	0	1.251812652	8.5	29.08	17,968	17,968	1,125	1,125	14.5189228	14.95609	1.484515	1109.13
11/24/13 6:12	0	1.229573393	8.52	29.08	17,690	17,690	1,105	1,105	14.2168655	15.00644	1.500949	1088.04
11/24/13 6:13	0	1.209232787	8.57	29.08	17,500	17,500	1,087	1,087	13.9406462	15.0568	1.517383	1068.68
11/24/13 6:14	0	1.189833915	8.6	29.08	17,279	17,279	1,070	1,070	13.6810608	15.10148	1.533817	1050.42
11/24/13 6:15	0	1.260670584	8.64	29.08	18,393	18,393	1,133	1,133	14.6350994	15.01549	1.550251	1117.22
11/24/13 6:16	0	1.312340326	8.7	27.04	19,280	19,280	1,158	1,158	15.3510466	14.94527	1.566684	1168.
11/24/13 6:17	0	1.29774883	8.73	25	19,131	19,131	1,131	1,131	15.1446199	14.98536	1.577536	1152.55
11/24/13 6:18	0	1.283372882	8.78	25	19,028	19,028	1,117	1,117	14.9381933	15.02544	1.582217	1138.28
11/24/13 6:19	0	1.329364284	8.83	25	19,822	19,822	1,155	1,155	15.508359	15.06243	1.586898	1177.62
11/24/13 6:20	0	1.425241272	8.74	25	21,035	21,035	1,237	1,237	16.7811527	15.02809	1.59158	1264.41
11/24/13 6:21	0	1.474284908	8.53	25	21,236	21,236	1,277	1,277	17.4546967	14.99599	1.596261	1309.72
11/24/13 6:22	0	1.484994069	8.54	25	21,415	21,415	1,284	1,284	17.5860596	15.01522	1.600942	1318.51
11/24/13 6:23	0	1.495696247	8.64	25	21,822	21,822	1,185	1,185	17.7174225	15.03445	1.605624	1327.29
11/24/13 6:24	0.1	1.506391525	8.69	23.55	22,105	22,105	1,128	1,128	17.8487854	15.05367	1.610305	1338.05
11/24/13 6:25	0.1	1.516994899	8.77	22.83	22,466	22,466	1,133	1,133	17.9801502	15.07141	1.614987	1344.79
11/24/13 6:26	0.2	1.525621862	8.83	22.83	22,748	22,748	1,135	1,135	18.1115131	15.05484	1.619668	1353.51
11/24/13 6:27	0.2	1.553259778	8.88	22.83	23,292	23,292	1,152	1,152	18.4986038	15.03827	1.624349	1379.13
11/24/13 6:28	0.1	1.597761239	8.92	22.83	24,067	24,067	1,181	1,181	19.1170692	15.0217	1.629031	1419.79
11/24/13 6:29	0.2	1.646271279	8.93	22.83	24,825	24,825	1,213	1,213	19.7355347	15.07746	1.633712	1460.07
11/24/13 6:30	0.3	1.695115371	8.92	22.83	25,533	25,533	1,245	1,245	20.3540001	15.14201	1.638393	1500.01
11/24/13 6:31												

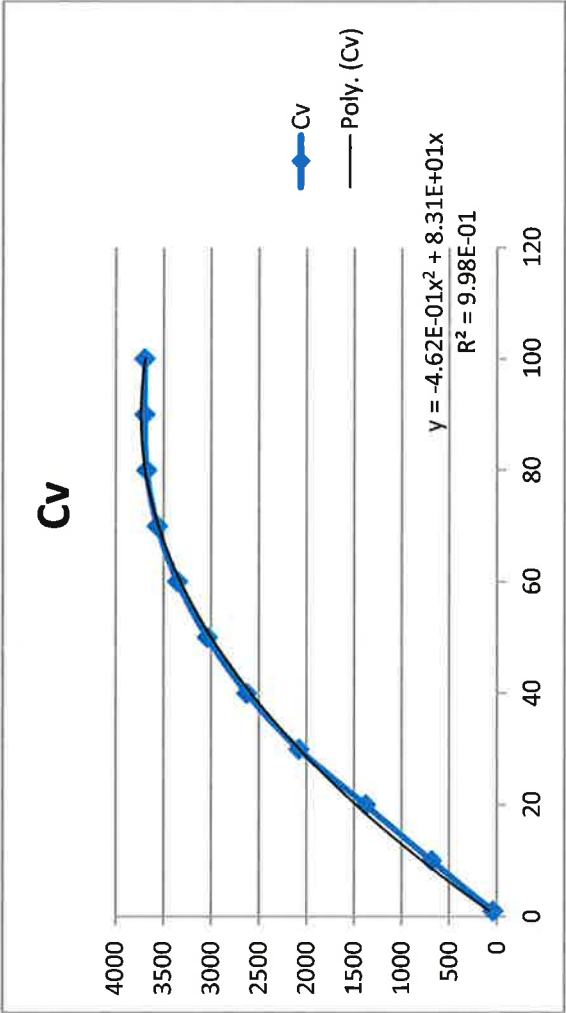
11/24/13 6:47	0.2	1.750241106	8.28	27.91	24,472	24,472	1,293	1,293	21.3052769	15.01682	1.717977	1560.7
11/24/13 6:48	0.2	1.738674306	8.36	28.46	24,545	24,545	1,287	1,287	21.151432	15.01207	1.72258	1550.98
11/24/13 6:49	0.2	1.723533471	8.45	28.46	24,593	24,593	1,278	1,278	20.947916	15.00725	1.727261	1538.03
11/24/13 6:50	0.2	1.708359827	8.48	28.46	24,463	24,463	1,269	1,269	20.7443981	15.00243	1.736624	1518.83
11/24/13 6:51	0.2	1.700790994	8.47	28.46	24,326	24,326	1,266	1,266	20.6473293	14.9976	1.736624	1518.83
11/24/13 6:52	0.2	1.713316596	8.49	28.46	24,563	24,563	1,277	1,277	20.8308945	14.99278	1.741305	1530.57
11/24/13 6:53	0.2	1.725797664	8.47	28.46	24,684	24,684	1,289	1,289	21.0144596	14.98796	1.745987	1542.27
11/24/13 6:54	0.2	1.738234285	8.42	28.46	24,715	24,715	1,328	1,328	21.1980247	14.98313	1.750688	1553.95
11/24/13 6:55	0.2	1.750626556	8.37	28.16	24,743	24,743	1,355	1,355	21.3815899	14.97831	1.75535	1565.58
11/24/13 6:56	0.2	1.762974383	8.38	28.1	24,948	24,948	1,367	1,367	21.585155	14.97348	1.780031	1577.20
11/24/13 6:57	0.1	1.77666933	8.38	28.1	25,142	25,142	1,379	1,379	21.7618999	14.9755	1.764712	1589.6
11/24/13 6:58	0.2	1.793539896	8.36	28.1	25,320	25,320	1,394	1,394	21.9933929	14.98892	1.769394	1604.17
11/24/13 6:59	0.1	1.810366062	8.34	28.1	25,496	25,496	1,409	1,409	22.224884	15.00233	1.774075	1618.68
11/24/13 7:00	0.1	1.827174798	8.34	28.1	25,732	25,732	1,424	1,424	22.456377	15.01575	1.778756	1633.14
11/24/13 7:01	0	1.831662345	8.36	28.1	25,858	25,858	1,429	1,429	22.512331	15.02916	1.783438	1636.63
11/24/13 7:02	0	1.782714185	8.35	28.07	25,137	25,137	1,393	1,393	21.8051586	15.04302	1.788275	1592.34
11/24/13 7:03	0.2	1.734819832	8.36	27.94	24,491	24,491	1,357	1,357	21.1207981	15.05644	1.792956	1549.04
11/24/13 7:04	0.1	1.685217796	8.34	27.94	23,734	23,734	1,320	1,320	20.4364376	15.05132	1.797638	1505.31
11/24/13 7:05	0.1	1.647759467	8.3	27.94	23,095	23,095	1,292	1,292	19.9764347	14.98803	1.802319	1475.67
11/24/13 7:06	0.1	1.666909325	8.28	27.94	23,307	23,307	1,309	1,309	20.2892132	14.93984	1.807001	1495.8
11/24/13 7:07	0.2	1.691063544	8.27	27.94	23,616	23,616	1,330	1,330	20.6019936	14.97189	1.811682	1515.93
11/24/13 7:08	0.1	1.715160167	8.25	27.94	23,895	23,895	1,350	1,350	20.914772	15.00393	1.816419	1535.92
11/24/13 7:09	0	1.735963367	8.25	27.94	24,184	24,184	1,369	1,369	21.1820717	15.03597	1.821318	1552.9
11/24/13 7:10	0	1.737180987	8.01	28.24	23,497	23,497	1,371	1,371	21.1738243	15.06802	1.826216	1552.41
11/24/13 7:11	0	1.738397449	7.92	28.55	23,250	23,250	1,373	1,373	21.1655769	15.10006	1.831115	1551.89
11/24/13 7:12	0	1.739079486	8	28.55	23,494	23,494	1,374	1,374	21.1573277	15.12406	1.836013	1551.36
11/24/13 7:13	0	1.736927348	8.08	28.55	23,699	23,699	1,373	1,373	21.1490803	15.10528	1.840911	1550.84
11/24/13 7:14	0	1.734811407	8.12	28.55	23,788	23,788	1,372	1,372	21.1409702	15.08681	1.845728	1550.32
11/24/13 7:15	0	1.732623855	8.16	28.55	23,875	23,875	1,371	1,371	21.1325836	15.06772	1.850708	1549.79
11/24/13 7:16	0	1.730472568	8.19	28.55	23,933	23,933	1,370	1,370	21.1243362	15.04894	1.855606	1549.27
11/24/13 7:17	0	1.724226343	8.18	28.55	23,817	23,817	1,365	1,365	21.058403	15.03016	1.860505	1545.07
11/24/13 7:18	0	1.652617897	8.16	27.72	22,772	22,772	1,308	1,308	20.0778656	15.0117	1.865321	1482.22
11/24/13 7:19	0	1.585065529	8.17	27.31	21,868	21,868	1,254	1,254	19.1651859	14.99292	1.87022	1422.93
11/24/13 7:20	0	1.654188727	8.16	27.31	22,794	22,794	1,308	1,308	20.1202755	14.99812	1.875118	1484.96
11/24/13 7:21	0	1.598331185	8.16	27.31	22,024	22,024	1,263	1,263	19.3464451	15.00393	1.880017	1434.7
11/24/13 7:22	0	1.541854458	8.16	27.31	21,246	21,246	1,218	1,218	18.5726147	15.00974	1.884915	1384.02
11/24/13 7:23	0	1.484756435	8.16	27.31	20,459	20,459	1,172	1,172	17.7987823	15.01556	1.889813	1332.71
11/24/13 7:24	0	1.432529768	8.16	27.31	19,739	19,739	1,131	1,131	17.0981579	15.02137	1.894712	1285.79
11/24/13 7:25	0	1.520224345	8.15	27.31	20,922	20,922	1,199	1,199	18.2764835	15.02718	1.89961	1364.45
11/24/13 7:26	0	1.47480679	8.13	28.1	20,247	20,247	1,163	1,163	17.8627216	15.033	1.904508	1323.64
11/24/13 7:27	0	1.421647919	8.13	28.1	19,517	19,517	1,120	1,120	16.9710445	15.0114	1.909407	1277.27
11/24/13 7:28	0	1.367918578	8.14	28.1	18,803	18,803	1,077	1,077	16.2793655	14.98634	1.914305	1230.37
11/24/13 7:29	0	1.31381788	8.17	28.1	18,126	18,126	1,034	1,034	15.5876884	14.96127	1.919204	1183.08
11/24/13 7:30	0	1.259347416	8.21	28.1	17,459	17,459	991	991	14.8960104	14.9362	1.924102	1135.34
11/24/13 7:31	0	1.272184341	8.23	28.1	17,680	17,680	1,000	1,000	15.0823364	14.91114	1.929	1148.24
11/24/13 7:32	0	1.287865617	8.26	28.1	17,964	17,964	1,012	1,012	15.3083861	14.89607	1.933899	1163.75
11/24/13 7:33	0	1.307883678	8.11	27.6	17,909	17,909	1,027	1,027	15.5275946	14.95005	1.938715	1178.95
11/24/13 7:34	0	1.325289679	7.84	26.61	17,546	17,546	1,040	1,040	15.682478	15.06872	1.943695	1189.51
11/24/13 7:35	0	1.336001336	7.96	26.61	17,958	17,958	1,048	1,048	15.83043	15.06219	1.948594	1199.73
11/24/13 7:36	0	1.343104945	8.1	26.61	18,371	18,371	1,053	1,053	15.9783831	14.98681	1.953492	1209.85
11/24/13 7:37	0	1.353543879	8.2	26.61	18,742	18,742	1,061	1,061	16.1236689	14.98038	1.958309	1219.78
11/24/13 7:38	0.1	1.307110841	8.26	26.61	18,232	18,232	1,024	1,024	15.4934692	15.0146	1.963289	1176.60
11/24/13 7:39	0.1	1.258161878	8.29	26.61	17,613	17,613	985	985	14.8377676	15.04769	1.968106	1131.30
11/24/13 7:40	0.1	1.335280055	8.32	26.61	18,760	18,760	1,018	1,018	15.8240786	15.08134	1.973004	1199.29
11/24/13 7:41	0.2	1.418164582	8.35	25.11	19,996	19,996	1,065	1,065	16.9127941	15.09548	1.977902	1273.30
11/24/13 7:42	0.2	1.501232895	8.39	24.36	21,269	21,269	1,127	1,127	18.0378017	15.08627	1.982964	1348.62
11/24/13 7:43	0.2	1.518553199	8.39	24.36	21,515	21,515	1,140	1,140	18.2833481	15.07735	1.987862	1364.90
11/24/13 7:44	0.2	1.534205783	8.39	24.36	21,736	21,736	1,151	1,151	18.5072765	15.06843	1.992761	1379.71
11/24/13 7:45	0.2	1.549788923	8.43	24.36	22,062	22,062	1,163	1,163	18.7312031	15.05952	1.997659	1394.46
11/24/13 7:46	0.2	1.565302822	8.42	24.36	22,256	22,256	1,174	1,174	18.9551315	15.0506	2.002558	1409.17
11/24/13 7:47	0.1	1.580747694	8.42	24.36	22,476	22,476	1,186	1,186	19.1790581	15.04168	2.007456	1423.83
11/24/13 7:48	0.2	1.596123527	8.39	24.36	22,614	22,614	1,142	1,142	19.4029865	15.03277	2.012354	1438.45
11/24/13 7:49	0.1	1.611430214	8.36	24.35	22,749	22,749	1,124	1,124	19.6269131	15.02385	2.017252	1453.02
11/24/13 7:50	0.3	1.626688029	8.34	24.35	22,909	22,909	1,133	1,133	19.8508415	15.01493	2.022151	1467.55
11/24/13 7:51	0.2	1.618804259	8.32	24.35	22,744	22,744	1,126	1,126	19.7534237	15.00601	2.027049	1461.23
11/24/13 7:52	0.2	1.610345804	8.26	24.35	22,462	22,462	1,119	1,119	19.647768	14.9971	2.031948	1454.38
11/24/13 7:53	0.2	1.602024335	8.26	24.35	22,345	22,345	1,112	1,112	19.5438728	14.98633	2.036764	1447.62
11/24/13 7:54	0.2	1.59355844	8.27	24.35	22,254	22,254	1,105	1,105	19.4382153	14.97941	2.041663	1440.75
11/24/13 7:55	0.2	1.584947962	8.22	24.35	22,000	22,000	1,098	1,098	19.3307991	14.97035	2.046643	1433.74
11/24/13 7:56	0.1	1.576616148	8.2	24.65	21,831	21,831	1,090	1,090	19.226902	14.96158	2.05146	1426.96
11/24/13 7:57	0.2	1.568139752	8	26.15	21,184	21,184	1,083	1,083	19.1212463	14.95286	2.056358	1420.05
11/24/13 7:58	0.4	1.559965039	7.75	26.15	20,415	20,415	1,076	1,076	19.0155907	14.94875	2.061256	1413.14
11/24/13 7:59	0.3	1.552829623	7.81	26.15	20,479	20,479	1,070	1,070	18.9099331	14.96207	2.066155	1406.21
11/24/13 8:00	0.4	1.557026177	7.95	26.15	20,903	20,903	1,072	1,072	18.9607563	14.9754	2.071053	1409.54
11/24/13 8:01	0.5	1.561715373	8.02	26.15	21,150	21,150	1,074	1,074	19.018383	14.98872	2.075951	1413.32
11/24/13 8:02	0.4	1.56640472	8.07	26.15	21,346	21,346	1,076	1,076	19.0760098	15.00206	2.08065	1417.09
11/24/13 8:03	0.4	1.571095279	8.1	26.15	21,490	21,490	1,077	1,077	19.1336384	15.01542	2.085748	1420.86
11/24/13 8:04	0.1	1.57578529	8.14	26.15	21,660	21,660	1,122	1,122	19.1912651	15.02878	2.090647	1424.63
11/24/13 8:05</												

11/24/13 8:21	0.5	1.666129242	8.12	27.08	22,846	22,846	1,215	1,215	48.0135612	14.99455	1.850574	2924.87
11/24/13 8:22	0.5	1.666129242	8.12	27.08	22,846	22,846	1,215	1,215	47.1757698	14.95011	1.817582	2892.10
11/24/13 8:23	0.5	1.666129242	8.1	27.08	22,789	22,789	1,215	1,215	48.5947075	14.97161	1.78459	2947.23
11/24/13 8:24	0.5	1.666129242	8.08	27.08	22,733	22,733	1,215	1,215	47.4543037	14.99105	1.762988	2903.0
11/24/13 8:25	0.5	1.666129242	8.06	27.08	22,677	22,677	1,215	1,215	45.9696388	14.99957	1.795078	2843.77
11/24/13 8:26	0.6	1.666129242	8.04	27.08	22,621	22,621	1,216	1,216	46.1895218	15.00809	1.827167	2852.68
11/24/13 8:27	0.6	1.666129242	8.04	27.08	22,621	22,621	1,216	1,216	46.6165009	15.01661	1.859257	2869.8
11/24/13 8:28	0.5	1.666129242	8.03	27.08	22,593	22,593	1,217	1,217	47.0434761	15.02513	1.891347	2886.86
11/24/13 8:29	0.5	1.666129242	8.03	27.08	22,593	22,593	1,217	1,217	47.4704552	15.03365	1.923437	2903.70
11/24/13 8:30	0.5	1.666129242	7.93	27.08	22,311	22,311	1,218	1,218	46.9056015	15.04216	1.955527	2881.39
11/24/13 8:31	0.3	1.666129242	7.62	27.08	21,439	21,439	1,219	1,219	46.1055679	15.05068	1.987616	2849.28
11/24/13 8:32	0.3	1.666129242	7.52	27.08	21,158	21,158	1,219	1,219	45.9888649	15.0592	2.019706	2844.55
11/24/13 8:33	0.1	1.666129242	7.54	27.08	21,214	21,214	1,220	1,220	46.0341911	15.06772	2.051796	2846.39
11/24/13 8:34	0	1.666129242	7.6	27.08	21,383	21,383	1,220	1,220	47.2174492	15.07624	2.083886	2893.74
11/24/13 8:35	0	1.666129242	7.61	27.08	21,411	21,411	1,221	1,221	47.5885582	15.08015	2.107131	2908.33
11/24/13 8:36	0	1.666129242	7.62	27.08	21,439	21,439	1,222	1,222	47.5387268	15.0832	2.042727	2906.3
11/24/13 8:37	0	1.666129242	7.62	27.08	21,439	21,439	1,222	1,222	47.4888954	15.08624	1.978325	2904.42
11/24/13 8:38	0.6	1.666129242	7.61	27.08	21,411	21,411	1,223	1,223	47.7809448	15.08928	1.913922	2915.84
11/24/13 8:39	0.3	1.666129242	7.61	27.08	21,411	21,411	1,223	1,223	48.263916	15.09233	1.849519	2934.54
11/24/13 8:40	0.1	1.666129242	7.56	27.08	21,270	21,270	1,224	1,224	48.7468834	15.09537	1.785116	2953.03
11/24/13 8:41	0.6	1.666129242	7.55	27.08	21,242	21,242	1,225	1,225	48.9176619	15.09841	1.720713	2959.52
11/24/13 8:42	0.5	1.666129242	7.56	27.08	21,270	21,270	1,225	1,225	48.9146118	15.10146	1.65631	2959.40
11/24/13 8:43	0.5	1.666129242	7.59	27.08	21,355	21,355	1,226	1,226	48.9113617	15.1045	1.591907	2959.28
11/24/13 8:44	0.6	1.666129242	7.6	27.08	21,383	21,383	1,226	1,226	49.6565514	15.08806	1.527504	2987.27
11/24/13 8:45	0.6	1.666129242	7.59	27.08	21,355	21,355	1,227	1,227	50.7421532	15.06862	1.467395	3027.13
11/24/13 8:46	0.6	1.666129242	7.61	27.08	21,411	21,411	1,228	1,228	51.8859177	15.04815	1.595952	3067.94
11/24/13 8:47	0.6	1.666129242	7.66	27.08	21,552	21,552	1,228	1,228	53.0684471	15.02698	1.741379	3108.87
11/24/13 8:48	0.6	1.666129242	7.61	27.08	21,411	21,411	1,229	1,229	54.289753	15.00512	1.891573	3149.7
11/24/13 8:49	0.6	1.666129242	7.53	27.08	21,186	21,186	1,229	1,229	55.4528999	14.9843	2.034615	3187.47
11/24/13 8:50	0.6	1.666129242	7.46	26.38	20,989	20,989	1,230	1,230	55.6417656	14.96452	2.170506	3193.47
11/24/13 8:51	0.6	1.666129242	7.42	34.87	20,876	20,876	1,231	1,231	55.2116508	14.9685	2.313548	3179.76
11/24/13 8:52	0.7	1.666129242	7.4	34.87	20,820	20,820	1,231	1,231	54.7815399	14.98037	2.294951	3165.87
11/24/13 8:53	0.7	1.666129242	7.37	34.87	20,736	20,736	1,232	1,232	54.3514252	14.99225	2.266342	3151.8
11/24/13 8:54	0.4	1.666129242	7.37	34.87	20,736	20,736	1,232	1,232	54.4422798	15.00393	2.238209	3154.80
11/24/13 8:55	0.3	1.666129242	7.38	34.87	20,764	20,764	1,233	1,233	54.9324036	15.01581	2.2096	3170.76
11/24/13 8:56	0.4	1.666129242	7.41	34.87	20,848	20,848	1,234	1,234	55.455204	15.02847	2.179083	3187.54
11/24/13 8:57	0.4	1.666129242	7.43	34.87	20,904	20,904	1,234	1,234	56.7177048	15.04035	2.150474	3227.03
11/24/13 8:58	0.1	1.666129242	7.45	34.84	20,961	20,961	1,546	1,546	56.5148964	15.05223	2.121864	3220.79
11/24/13 8:59	0	1.666129242	7.45	34.82	20,961	20,961	1,704	1,704	56.838459	15.06331	2.095162	3230.73
11/24/13 9:00	0	1.666129242	7.43	34.82	20,904	20,904	1,708	1,708	57.0406809	15.05044	2.064645	3236.89
11/24/13 9:01	0	1.666129242	7.43	34.82	20,904	20,904	1,712	1,712	56.3091393	15.01656	2.036036	3214.41
11/24/13 9:02	0	1.666129242	7.43	34.82	20,904	20,904	1,716	1,716	55.5776176	14.98269	2.007426	3191.44
11/24/13 9:03	0.1	1.666129242	7.4	34.82	20,820	20,820	1,720	1,720	56.3396416	14.99838	1.978817	3215.36
11/24/13 9:04	0.6	1.666129242	7.33	34.82	20,623	20,623	1,723	1,723	57.9148788	15.05053	1.951638	3263.11
11/24/13 9:05	0.8	1.666129242	7.32	35.34	20,595	20,595	1,779	1,779	59.6559372	15.10817	1.921598	3313.22
11/24/13 9:06	1	1.666129242	7.36	36.38	20,707	20,707	1,805	1,805	62.2977409	15.1594	1.894896	3383.91
11/24/13 9:07	0.9	1.666129242	7.43	36.38	20,904	20,904	1,802	1,802	66.1568451	15.21795	1.864379	3475.58
11/24/13 9:08	1	1.666129242	7.52	36.38	21,158	21,158	1,799	1,799	69.7747574	15.27285	1.835769	3549.02
Total	2.1	10.1			Total SO2 (lbs)	148,276		7,552				
					Total H2S (lbs)	1,575						

Total Event 2:	19.5	mmscf
	259,755	lbs SO2
	2760	lbs H2S
	18,210	lbs VOC

20x16" Fisher EWT-2 Control Valve, Up Flow, Linear, 16.25" Port, Whisper III Trim/Level A1, LN-S (Globe Type)

Travel	Cv
1	41
10	681
20	1376
30	2079
40	2626
50	3038
60	3353
70	3564
80	3678
90	3696
100	3696



	Final WG Flow (from F33651CR) (MMscfh)	TS HI Range (%)	WG VOC (%)	SO2 (lb/hr)	SO2 (lb)	VOC (lb/hr)	VOC (lb)
11/24/13 9:09	1.1	7.57	36.38	14,061	14,061	1,240	1,240
11/24/13 9:10	1.2	7.57	36.38	15,340	15,340	1,355	1,355
11/24/13 9:11	1.2	7.54	36.38	15,279	15,279	1,374	1,374
11/24/13 9:12	1.2	7.46	36.38	15,117	15,117	1,374	1,374
11/24/13 9:13	1.2	7.36	37.2	14,914	14,914	1,358	1,358
11/24/13 9:14	1.2	7.3	37.61	14,793	14,793	1,437	1,437
11/24/13 9:15	1.2	7.31	37.61	14,813	14,813	1,437	1,437
11/24/13 9:16	1.2	7.27	37.61	14,732	14,732	1,437	1,437
11/24/13 9:17	1.2	7.25	37.61	14,691	14,691	1,437	1,437
11/24/13 9:18	1.2	7.25	37.61	14,691	14,691	1,437	1,437
11/24/13 9:19	1.2	7.3	37.61	14,793	14,793	1,437	1,437
11/24/13 9:20	1.2	7.34	37.61	14,874	14,874	1,417	1,417
11/24/13 9:21	1.1	7.36	37.78	13,671	13,671	1,379	1,379
11/24/13 9:22	1.2	7.36	37.81	14,914	14,914	1,444	1,444
11/24/13 9:23	1.1	7.38	37.81	13,708	13,708	1,343	1,343
11/24/13 9:24	1.1	7.31	37.81	13,578	13,578	1,363	1,363
11/24/13 9:25	1.2	7.23	37.81	14,651	14,651	1,404	1,404
11/24/13 9:26	1.2	7.14	37.81	14,468	14,468	1,424	1,424
11/24/13 9:27	1.2	7.02	37.81	14,225	14,225	1,465	1,465
11/24/13 9:28	1.1	6.97	37.88	12,947	12,947	1,367	1,367
11/24/13 9:29	1.2	6.94	38.26	14,063	14,063	1,469	1,469
11/24/13 9:30	1.2	6.66	38.26	13,496	13,496	1,490	1,490
11/24/13 9:31	1.2	6.48	38.26	13,131	13,131	1,490	1,490
11/24/13 9:32	1.2	6.71	38.26	13,597	13,597	1,469	1,469
11/24/13 9:33	1.1	6.99	38.26	12,984	12,984	1,407	1,407
11/24/13 9:34	1.1	7.3	38.26	13,560	13,560	1,366	1,366
11/24/13 9:35	1.1	7.56	38.26	14,043	14,043	1,366	1,366
11/24/13 9:36	1.1	7.72	36.61	14,340	14,340	1,285	1,285
11/24/13 9:37	1	7.97	34.96	13,459	13,459	1,184	1,184
11/24/13 9:38	1	8.24	34.96	13,915	13,915	1,223	1,223
11/24/13 9:39	1.1	8.53	34.96	15,845	15,845	1,223	1,223
11/24/13 9:40	1	8.77	34.96	14,809	14,809	1,165	1,165
11/24/13 9:41	1.1	8.92	34.96	16,569	16,569	1,262	1,262
11/24/13 9:42	1.1	8.92	34.96	16,569	16,569	1,262	1,262
11/24/13 9:43	1	8.9	34.96	15,029	15,029	1,145	1,145
11/24/13 9:44	1.1	9	33.55	16,718	16,718	1,169	1,169
11/24/13 9:45	1.1	9.06	33.27	16,829	16,829	1,191	1,191
11/24/13 9:46	1	9.1	33.27	15,367	15,367	1,119	1,119
11/24/13 9:47	1.1	9.19	33.27	17,071	17,071	1,173	1,173
11/24/13 9:48	1.1	9.19	33.27	17,071	17,071	1,209	1,209
11/24/13 9:49	1.1	9.2	33.27	17,089	17,089	1,155	1,155
11/24/13 9:50	1.1	9.28	33.27	17,238	17,238	1,155	1,155
11/24/13 9:51	1.1	9.42	33.27	17,498	17,498	1,227	1,227
11/24/13 9:52	1	9.56	31.48	16,144	16,144	1,034	1,034
11/24/13 9:53	1.1	9.65	31.48	17,925	17,925	1,084	1,084
11/24/13 9:54	1	9.76	31.48	16,481	16,481	1,050	1,050
11/24/13 9:55	1.1	9.71	31.48	18,037	18,037	1,050	1,050
11/24/13 9:56	1.1	9.63	31.48	17,888	17,888	1,100	1,100
11/24/13 9:57	1.2	9.61	31.48	19,474	19,474	1,167	1,167
11/24/13 9:58	1.2	9.69	31.48	19,636	19,636	1,250	1,250
11/24/13 9:59	1.4	9.75	31.83	23,050	23,050	1,387	1,387
11/24/13 10:00	1.5	9.87	32.53	25,001	25,001	1,529	1,529
11/24/13 10:01	1.4	9.87	32.53	23,334	23,334	1,512	1,512
11/24/13 10:02	1.4	10.14	32.53	23,972	23,972	1,477	1,477
11/24/13 10:03	1.4	10.63	32.53	25,131	25,131	1,494	1,494
11/24/13 10:04	1.4	10.96	32.53	25,911	25,911	1,459	1,459
11/24/13 10:05	1.4	11.47	32.53	27,116	27,116	1,459	1,459
11/24/13 10:06	1.4	12.13	32.53	28,677	28,677	1,459	1,459
11/24/13 10:07	1.4	12.49	33.25	29,528	29,528	1,490	1,490
11/24/13 10:08	1.4	12.68	33.61	29,977	29,977	1,514	1,514
11/24/13 10:09	1.4	12.78	33.61	30,213	30,213	1,533	1,533
11/24/13 10:10	1.4	12.65	33.61	29,906	29,906	1,533	1,533
11/24/13 10:11	1.4	12.48	33.61	29,504	29,504	1,533	1,533
11/24/13 10:12	1.4	12.39	33.61	29,291	29,291	1,533	1,533
11/24/13 10:13	1.4	12.19	33.61	28,819	28,819	1,533	1,533
11/24/13 10:14	1.4	11.87	33.61	28,062	28,062	1,533	1,533
11/24/13 10:15	1.4	11.62	35.85	27,471	27,471	1,657	1,657

11/24/13 10:16	1.4	11.4	35.85	26,951	26,951	1,657	1,657
11/24/13 10:17	1.3	11.03	35.85	24,214	24,214	1,598	1,598
11/24/13 10:18	1.4	10.88	35.85	25,722	25,722	1,618	1,618
11/24/13 10:19	1.3	10.82	35.85	23,753	23,753	1,558	1,558
11/24/13 10:20	1.3	10.5	35.85	23,050	23,050	1,558	1,558
11/24/13 10:21	1.2	10.32	35.85	20,912	20,912	1,420	1,420
11/24/13 10:22	1.2	10.35	35.89	20,973	20,973	1,422	1,422
11/24/13 10:23	1.2	10.16	36.08	20,588	20,588	1,432	1,432
11/24/13 10:24	1.2	10.1	36.08	20,466	20,466	1,392	1,392
11/24/13 10:25	1.2	10.03	36.08	20,325	20,325	1,432	1,432
11/24/13 10:26	1.2	9.96	36.08	20,183	20,183	1,392	1,392
11/24/13 10:27	1.2	9.95	36.08	20,163	20,163	1,373	1,373
11/24/13 10:28	1.1	9.8	36.08	18,204	18,204	1,293	1,293
11/24/13 10:29	1.2	9.54	36.08	19,332	19,332	1,392	1,392
11/24/13 10:30	1.2	9.5	35.36	19,251	19,251	1,403	1,403
11/24/13 10:31	1.2	9.29	34.63	18,825	18,825	1,412	1,412
11/24/13 10:32	1.2	9.21	34.63	18,663	18,663	1,374	1,374
11/24/13 10:33	1.2	9.38	34.63	19,007	19,007	1,412	1,412
11/24/13 10:34	1.2	9.19	34.63	18,622	18,622	1,412	1,412
11/24/13 10:35	1.3	9	34.63	19,757	19,757	1,469	1,469
11/24/13 10:36	1.2	9.16	34.63	18,562	18,562	1,431	1,431
11/24/13 10:37	1.3	9.15	34.63	20,087	20,087	1,469	1,469
11/24/13 10:38	1.4	8.9	35.05	21,041	21,041	1,583	1,583
11/24/13 10:39	1.3	8.76	35.13	19,230	19,230	1,528	1,528
11/24/13 10:40	1.3	8.65	35.13	18,989	18,989	1,547	1,547
11/24/13 10:41	1.3	8.69	35.13	19,077	19,077	1,489	1,489
11/24/13 10:42	1.3	8.65	35.13	18,989	18,989	1,489	1,489
11/24/13 10:43	1.3	8.55	35.13	18,769	18,769	1,509	1,509
11/24/13 10:44	1.4	8.52	35.13	20,142	20,142	1,625	1,625
11/24/13 10:45	1.4	8.33	35.19	19,693	19,693	1,667	1,667
11/24/13 10:46	1.5	8.34	35.48	21,125	21,125	1,744	1,744
11/24/13 10:47	1.4	8.09	35.48	19,126	19,126	1,666	1,666
11/24/13 10:48	1.4	7.88	35.48	18,629	18,629	1,646	1,646
11/24/13 10:49	1.4	7.89	35.48	18,653	18,653	1,666	1,666
11/24/13 10:50	1.4	7.82	35.48	18,487	18,487	1,666	1,666
11/24/13 10:51	1.4	7.7	35.48	18,204	18,204	1,646	1,646
11/24/13 10:52	1.4	7.88	35.48	18,629	18,629	1,666	1,666
11/24/13 10:53	1.5	7.82	35.36	19,808	19,808	1,759	1,759
11/24/13 10:54	1.5	7.58	35.12	19,200	19,200	1,729	1,729
11/24/13 10:55	1.5	7.67	35.12	19,428	19,428	1,729	1,729
11/24/13 10:56	1.5	7.7	35.12	19,504	19,504	1,710	1,710
11/24/13 10:57	1.5	7.61	35.12	19,276	19,276	1,690	1,690
11/24/13 10:58	1.5	7.62	35.12	19,301	19,301	1,748	1,748
11/24/13 10:59	1.5	7.5	35.12	18,997	18,997	1,768	1,768
11/24/13 11:00	1.5	7.36	35.12	18,643	18,643	1,748	1,748
11/24/13 11:01	1.5	7.7	35.53	19,504	19,504	1,767	1,767
11/24/13 11:02	1.6	7.9	35.73	21,345	21,345	1,855	1,855
11/24/13 11:03	1.5	8.33	35.73	21,100	21,100	1,796	1,796
11/24/13 11:04	1.5	8.6	35.73	21,784	21,784	1,776	1,776
11/24/13 11:05	1.5	8.81	35.73	22,316	22,316	1,776	1,776
11/24/13 11:06	1.6	8.87	35.73	23,965	23,965	1,835	1,835
11/24/13 11:07	1.6	8.87	35.73	23,965	23,965	1,894	1,894
11/24/13 11:08	1.6	8.73	35.73	23,587	23,587	1,835	1,835
11/24/13 11:09	1.6	8.73	35.52	23,587	23,587	1,885	1,885
11/24/13 11:10	1.6	8.67	35.52	23,425	23,425	1,885	1,885
11/24/13 11:11	1.6	8.36	35.52	22,587	22,587	1,885	1,885
11/24/13 11:12	1.6	8.16	35.52	22,047	22,047	1,885	1,885
11/24/13 11:13	1.6	8.24	35.52	22,263	22,263	1,885	1,885
11/24/13 11:14	1.6	7.94	35.52	21,453	21,453	1,924	1,924
11/24/13 11:15	1.6	7.51	35.52	20,291	20,291	1,885	1,885
11/24/13 11:16	1.5	7.51	35.52	19,023	19,023	1,828	1,828
11/24/13 11:17	1.4	7.46	35.51	17,636	17,636	1,720	1,720
11/24/13 11:18	1.5	7.12	35.51	18,035	18,035	1,740	1,740
11/24/13 11:19	1.4	6.78	35.51	16,029	16,029	1,661	1,661
11/24/13 11:20	1.4	6.98	35.51	16,502	16,502	1,661	1,661
11/24/13 11:21	1.4	7.03	35.51	16,620	16,620	1,681	1,681
11/24/13 11:22	1.4	7.14	35.51	16,880	16,880	1,700	1,700
11/24/13 11:23	1.4	7.19	35.51	16,998	16,998	1,661	1,661
11/24/13 11:24	1.3	7.12	34.08	15,630	15,630	1,536	1,536
11/24/13 11:25	1.3	7.03	32.65	15,433	15,433	1,472	1,472

11/24/13 11:26	1.4	7.04	32.65	16,643	16,643	1,544	1,544
11/24/13 11:27	1.5	7.16	32.65	18,136	18,136	1,617	1,617
11/24/13 11:28	1.3	7.21	32.65	15,828	15,828	1,472	1,472
11/24/13 11:29	1.5	7.07	32.65	17,908	17,908	1,617	1,617
11/24/13 11:30	1.5	7.1	32.65	17,984	17,984	1,672	1,672
11/24/13 11:31	1.4	7.03	32.65	16,620	16,620	1,563	1,563
11/24/13 11:32	0.5	6.87	33.46	5,801	5,801	514	514
11/24/13 11:33	0	6.69	33.62	0		0	
11/24/13 11:34	0	6.72	33.62	0		0	
11/24/13 11:35	0	6.7	33.62	0		0	
11/24/13 11:36	0	6.85	33.62	0		0	
11/24/13 11:37	0	6.82	33.62	0		0	
11/24/13 11:38	0	6.86	33.62	0		0	
11/24/13 11:39	0	7.09	33.5	0		0	
11/24/13 11:40	0	6.88	32.89	0		0	
11/24/13 11:41	0	7.05	32.89	0		0	
11/24/13 11:42	0.2	6.97	32.89	2,354	2,354	237	237
11/24/13 11:43	0.6	6.94	32.89	7,032	7,032	712	712
11/24/13 11:44	0.4	6.81	32.89	4,600	4,600	456	456
11/24/13 11:45	1	6.92	32.89	11,685	11,685	1,113	1,113
11/24/13 11:46	0.4	6.99	32.89	4,721	4,721	438	438
11/24/13 11:47	0.8	7.03	33.18	9,497	9,497	876	876
11/24/13 11:48	1	6.88	33.46	11,618	11,618	1,065	1,065
11/24/13 11:49	1	6.69	33.46	11,297	11,297	1,120	1,120
11/24/13 11:50	0.8	6.83	33.46	9,227	9,227	882	882
11/24/13 11:51	1.2	7.2	33.46	14,590	14,590	1,304	1,304
11/24/13 11:52	1.2	7.24	33.46	14,671	14,671	1,341	1,341
11/24/13 11:53	1.2	6.82	33.46	13,820	13,820	1,322	1,322
11/24/13 11:54	1.2	6.75	33.46	13,678	13,678	1,322	1,322
11/24/13 11:55	1.2	6.88	33.45	13,942	13,942	1,315	1,315
11/24/13 11:56	1.2	6.99	33.45	14,164	14,164	1,311	1,311
11/24/13 11:57	1.3	6.8	33.45	14,928	14,928	1,383	1,383
11/24/13 11:58	1.2	6.85	33.45	13,881	13,881	1,311	1,311
11/24/13 11:59	1.2	7.16	33.45	14,509	14,509	1,274	1,274
11/24/13 12:00	1.2	7.12	33.45	14,428	14,428	1,329	1,329
11/24/13 12:01	1.2	7	33.45	14,185	14,185	1,329	1,329
11/24/13 12:02	1.2	7.06	33.45	14,306	14,306	1,365	1,365
11/24/13 12:03	1.2	6.95	33.57	14,083	14,083	1,372	1,372
11/24/13 12:04	1.2	6.98	33.57	14,144	14,144	1,353	1,353
11/24/13 12:05	1.3	6.99	33.57	15,345	15,345	1,390	1,390
11/24/13 12:06	1.3	6.93	33.57	15,213	15,213	1,408	1,408
11/24/13 12:07	1.3	6.78	33.57	14,884	14,884	1,445	1,445
11/24/13 12:08	1.3	6.87	33.57	15,081	15,081	1,427	1,427
11/24/13 12:09	1.3	7.12	33.57	15,630	15,630	1,463	1,463
11/24/13 12:10	1.3	7.24	33.65	15,894	15,894	1,393	1,393
11/24/13 12:11	1.3	7.07	33.81	15,520	15,520	1,437	1,437
11/24/13 12:12	1.3	6.61	33.81	14,511	14,511	1,474	1,474
11/24/13 12:13	1.4	6.99	33.81	16,525	16,525	1,529	1,529
11/24/13 12:14	1.4	7.19	33.81	16,998	16,998	1,511	1,511
11/24/13 12:15	1.4	6.92	33.81	16,360	16,360	1,511	1,511
11/24/13 12:16	1.4	7.07	33.81	16,714	16,714	1,511	1,511
11/24/13 12:17	1.4	6.9	33.81	16,312	16,312	1,566	1,566
11/24/13 12:18	1.4	6.83	33.83	16,147	16,147	1,510	1,510
11/24/13 12:19	1.4	6.76	33.84	15,981	15,981	1,528	1,528
11/24/13 12:20	1.5	6.93	33.84	17,554	17,554	1,620	1,620
11/24/13 12:21	1.4	6.98	33.84	16,502	16,502	1,601	1,601
11/24/13 12:22	1.4	6.88	33.84	16,265	16,265	1,583	1,583
11/24/13 12:23	1.5	6.79	33.84	17,199	17,199	1,620	1,620
11/24/13 12:24	1.6	6.81	33.84	18,400	18,400	1,748	1,748
11/24/13 12:25	1.5	6.67	33.84	16,895	16,895	1,675	1,675
11/24/13 12:26	1.6	6.64	34.27	17,940	17,940	1,763	1,763
11/24/13 12:27	1.6	6.62	34.36	17,886	17,886	1,845	1,845
11/24/13 12:28	1.7	6.71	34.36	19,262	19,262	1,920	1,920
11/24/13 12:29	1.6	6.71	34.36	18,129	18,129	1,845	1,845
11/24/13 12:30	1.6	6.34	34.36	17,130	17,130	1,807	1,807
11/24/13 12:31	1.6	6.3	34.36	17,022	17,022	1,788	1,788
11/24/13 12:32	1.5	6.22	34.36	15,755	15,755	1,694	1,694
11/24/13 12:33	1.5	6.2	34.4	15,704	15,704	1,716	1,716
11/24/13 12:34	1.5	6.29	34.59	15,932	15,932	1,712	1,712
11/24/13 12:35	1.5	6.21	34.59	15,730	15,730	1,712	1,712

11/24/13 12:36	1.5	6.2	34.59	15,704	15,704	1,712	1,712
11/24/13 12:37	1.6	6.21	34.59	16,778	16,778	1,788	1,788
11/24/13 12:38	1.6	6.36	34.59	17,184	17,184	1,769	1,769
11/24/13 12:39	1.6	6.47	34.59	17,481	17,481	1,827	1,827
11/24/13 12:40	1.5	6.36	34.59	16,110	16,110	1,712	1,712
11/24/13 12:41	1.6	6.26	34.14	16,914	16,914	1,809	1,809
11/24/13 12:42	1.6	6.39	33.69	17,265	17,265	1,792	1,792
11/24/13 12:43	1.6	6.3	33.69	17,022	17,022	1,792	1,792
11/24/13 12:44	1.6	6.29	33.69	16,995	16,995	1,792	1,792
11/24/13 12:45	1.6	6.28	33.69	16,968	16,968	1,811	1,811
11/24/13 12:46	1.6	6.38	33.69	17,238	17,238	1,792	1,792
11/24/13 12:47	1.6	6.48	33.69	17,508	17,508	1,792	1,792
11/24/13 12:48	1.6	6.37	33.69	17,211	17,211	1,792	1,792
11/24/13 12:49	1.6	6.3	34.45	17,022	17,022	1,837	1,837
11/24/13 12:50	1.6	6.22	34.6	16,805	16,805	1,846	1,846
11/24/13 12:51	1.6	6.33	34.6	17,103	17,103	1,807	1,807
11/24/13 12:52	1.6	6.39	34.6	17,265	17,265	1,884	1,884
11/24/13 12:53	1.6	6.26	34.6	16,914	16,914	1,788	1,788
11/24/13 12:54	1.6	6.24	34.6	16,860	16,860	1,884	1,884
11/24/13 12:55	1.6	6.17	34.6	16,670	16,670	1,903	1,903
11/24/13 12:56	1.6	6.16	34.6	16,643	16,643	1,865	1,865
11/24/13 12:57	1.6	6.3	34.58	17,022	17,022	1,848	1,848
11/24/13 12:58	1.6	6.56	34.58	17,724	17,724	1,905	1,905
11/24/13 12:59	1.6	6.51	34.58	17,589	17,589	1,848	1,848
11/24/13 13:00	1.6	6.35	34.58	17,157	17,157	1,848	1,848
11/24/13 13:01	1.6	6.24	34.58	16,860	16,860	1,886	1,886
11/24/13 13:02	1.6	6.32	34.58	17,076	17,076	1,867	1,867
11/24/13 13:03	1.6	6.3	34.58	17,022	17,022	1,848	1,848
11/24/13 13:04	1.6	6.24	34.41	16,860	16,860	1,880	1,880
11/24/13 13:05	1.6	6.39	34.07	17,265	17,265	1,847	1,847
11/24/13 13:06	1.6	6.24	34.07	16,860	16,860	1,885	1,885
11/24/13 13:07	1.6	6.1	34.07	16,481	16,481	1,847	1,847
11/24/13 13:08	1.7	6.27	34.07	17,999	17,999	1,924	1,924
11/24/13 13:09	1.7	6.31	34.07	18,114	18,114	1,943	1,943
11/24/13 13:10	1.7	6.1	34.07	17,511	17,511	1,943	1,943
11/24/13 13:11	1.7	6.3	34.07	18,085	18,085	1,943	1,943
11/24/13 13:12	1.7	6.32	34.22	18,143	18,143	1,974	1,974
11/24/13 13:13	1.7	6.21	34.3	17,827	17,827	1,999	1,999
11/24/13 13:14	1.7	6.26	34.3	17,971	17,971	1,979	1,979
11/24/13 13:15	1.7	6.34	34.3	18,200	18,200	1,999	1,999
11/24/13 13:16	1.7	6.25	34.3	17,942	17,942	1,979	1,979
11/24/13 13:17	1.8	6.18	34.3	18,785	18,785	2,056	2,056
11/24/13 13:18	1.8	5.92	34.3	17,994	17,994	2,018	2,018
11/24/13 13:19	1.7	6.04	34.3	17,339	17,339	1,941	1,941
11/24/13 13:20	1.6	6.29	34.29	16,995	16,995	1,825	1,825
11/24/13 13:21	1.6	6.31	34.29	17,049	17,049	1,805	1,805
11/24/13 13:22	1.6	5.96	34.29	16,103	16,103	1,882	1,882
11/24/13 13:23	1.7	5.99	34.29	17,196	17,196	1,940	1,940
11/24/13 13:24	1.8	6.17	34.29	18,754	18,754	2,016	2,016
11/24/13 13:25	1.8	6.2	34.29	18,845	18,845	2,055	2,055
11/24/13 13:26	1.8	6.09	34.29	18,511	18,511	2,016	2,016
11/24/13 13:27	1.8	6.07	34.19	18,450	18,450	2,050	2,050
11/24/13 13:28	1.8	6.13	33.69	18,633	18,633	2,008	2,008
11/24/13 13:29	1.8	5.96	33.69	18,116	18,116	1,989	1,989
11/24/13 13:30	1.7	6.18	33.69	17,741	17,741	1,913	1,913
11/24/13 13:31	1.7	5.89	33.69	16,908	16,908	1,913	1,913
11/24/13 13:32	1.6	6.25	33.69	16,887	16,887	1,818	1,818
11/24/13 13:33	1.6	6.41	33.69	17,319	17,319	1,837	1,837
11/24/13 13:34	1.6	6.27	33.69	16,941	16,941	1,818	1,818
11/24/13 13:35	1.6	6.31	33.29	17,049	17,049	1,797	1,797
11/24/13 13:36	1.6	6.36	32.9	17,184	17,184	1,832	1,832
11/24/13 13:37	1.5	6.14	32.9	15,553	15,553	1,703	1,703
11/24/13 13:38	1.6	6.12	32.9	16,535	16,535	1,832	1,832
11/24/13 13:39	1.6	6.14	32.9	16,589	16,589	1,795	1,795
11/24/13 13:40	1.6	6.33	32.9	17,103	17,103	1,777	1,777
11/24/13 13:41	1.6	6.49	32.9	17,535	17,535	1,758	1,758
11/24/13 13:42	1.5	6.17	32.9	15,628	15,628	1,666	1,666
11/24/13 13:43	1.5	6.02	33.4	15,249	15,249	1,652	1,652
11/24/13 13:44	1.6	6.16	33.5	16,643	16,643	1,769	1,769
11/24/13 13:45	1.6	6.53	33.5	17,643	17,643	1,845	1,845

11/24/13 13:46	1.6	6.72	33.5	18,156	18,156	1,769	1,769
11/24/13 13:47	1.6	6.44	33.5	17,400	17,400	1,769	1,769
11/24/13 13:48	1.6	6.45	33.5	17,427	17,427	1,826	1,826
11/24/13 13:49	1.5	6.4	33.5	16,211	16,211	1,713	1,713
11/24/13 13:50	1.5	6.43	33.5	16,287	16,287	1,732	1,732
11/24/13 13:51	1.6	6.38	33.47	17,238	17,238	1,748	1,748
11/24/13 13:52	1.6	6.08	33.47	16,427	16,427	1,786	1,786
11/24/13 13:53	1.5	6.2	33.47	15,704	15,704	1,767	1,767
11/24/13 13:54	1.5	6.28	33.47	15,907	15,907	1,711	1,711
11/24/13 13:55	1.6	6.38	33.47	17,238	17,238	1,767	1,767
11/24/13 13:56	1.5	6.36	33.47	16,110	16,110	1,711	1,711
11/24/13 13:57	1.6	6.27	33.47	16,941	16,941	1,786	1,786
11/24/13 13:58	1.6	6.04	33.58	16,319	16,319	1,790	1,790
11/24/13 13:59	1.6	6.12	33.81	16,535	16,535	1,780	1,780
11/24/13 14:00	1.5	6.45	33.81	16,338	16,338	1,648	1,648
11/24/13 14:01	1.5	6.25	33.81	15,831	15,831	1,762	1,762
11/24/13 14:02	1.5	5.98	33.81	15,147	15,147	1,705	1,705
11/24/13 14:03	1.4	6.14	33.81	14,516	14,516	1,610	1,610
11/24/13 14:04	1.5	6.09	33.81	15,426	15,426	1,724	1,724
11/24/13 14:05	1.5	6.27	33.81	15,882	15,882	1,648	1,648
11/24/13 14:06	1.5	6.14	33.48	15,553	15,553	1,710	1,710
11/24/13 14:07	1.5	5.98	33.32	15,147	15,147	1,647	1,647
11/24/13 14:08	1.4	6.01	33.32	14,208	14,208	1,628	1,628
11/24/13 14:09	1.4	5.96	33.32	14,090	14,090	1,609	1,609
11/24/13 14:10	1.5	6.07	33.32	15,375	15,375	1,722	1,722
11/24/13 14:11	1.5	6.22	33.32	15,755	15,755	1,684	1,684
11/24/13 14:12	1.6	6.37	33.32	17,211	17,211	1,797	1,797
11/24/13 14:13	1.6	6.13	33.32	16,562	16,562	1,834	1,834
11/24/13 14:14	1.7	5.77	33.14	16,564	16,564	1,860	1,860
11/24/13 14:15	1.7	6	33.14	17,224	17,224	1,878	1,878
11/24/13 14:16	1.7	6.05	33.14	17,368	17,368	1,878	1,878
11/24/13 14:17	1.7	6.02	33.14	17,282	17,282	1,860	1,860
11/24/13 14:18	1.6	6.12	33.14	16,535	16,535	1,804	1,804
11/24/13 14:19	1.6	6.12	33.14	16,535	16,535	1,785	1,785
11/24/13 14:20	1.6	6.08	33.14	16,427	16,427	1,822	1,822
11/24/13 14:21	1.6	5.93	33.13	16,022	16,022	1,784	1,784
11/24/13 14:22	1.6	6	33.08	16,211	16,211	1,743	1,743
11/24/13 14:23	1.6	6.14	33.08	16,589	16,589	1,798	1,798
11/24/13 14:24	1.6	6.22	33.08	16,805	16,805	1,780	1,780
11/24/13 14:25	1.5	6.14	33.08	15,553	15,553	1,687	1,687
11/24/13 14:26	1.4	6.08	33.08	14,374	14,374	1,613	1,613
11/24/13 14:27	1.5	6.09	33.08	15,426	15,426	1,631	1,631
11/24/13 14:28	1.4	5.94	33.08	14,043	14,043	1,557	1,557
11/24/13 14:29	1.4	6.13	33.39	14,492	14,492	1,610	1,610
11/24/13 14:30	1.4	5.96	33.7	14,090	14,090	1,624	1,624
11/24/13 14:31	1.5	6	33.7	15,198	15,198	1,718	1,718
11/24/13 14:32	1.4	5.92	33.7	13,996	13,996	1,586	1,586
11/24/13 14:33	1.4	6.18	33.7	14,610	14,610	1,567	1,567
11/24/13 14:34	1.4	6.29	33.7	14,870	14,870	1,548	1,548
11/24/13 14:35	1.4	6.17	33.7	14,587	14,587	1,586	1,586
11/24/13 14:36	1.4	6.05	33.7	14,303	14,303	1,567	1,567
11/24/13 14:37	1.4	6.07	33.84	14,350	14,350	1,606	1,606
11/24/13 14:38	1.4	6.05	33.87	14,303	14,303	1,587	1,587
11/24/13 14:39	1.4	6.08	33.87	14,374	14,374	1,606	1,606
11/24/13 14:40	1.6	6.03	33.87	16,292	16,292	1,776	1,776
11/24/13 14:41	1.5	6	33.87	15,198	15,198	1,700	1,700
11/24/13 14:42	1.5	5.98	33.87	15,147	15,147	1,719	1,719
11/24/13 14:43	1.6	5.9	33.87	15,941	15,941	1,776	1,776
11/24/13 14:44	1.5	5.97	33.93	15,122	15,122	1,737	1,737
11/24/13 14:45	1.5	6.06	34.21	15,350	15,350	1,697	1,697
11/24/13 14:46	1.5	6.04	34.21	15,299	15,299	1,697	1,697
11/24/13 14:47	1.5	5.97	34.21	15,122	15,122	1,697	1,697
11/24/13 14:48	1.5	6.06	34.21	15,350	15,350	1,697	1,697
11/24/13 14:49	1.5	6	34.21	15,198	15,198	1,678	1,678
11/24/13 14:50	1.5	5.98	34.21	15,147	15,147	1,734	1,734
11/24/13 14:51	1.6	5.99	34.21	16,184	16,184	1,772	1,772
11/24/13 14:52	1.6	6.02	34.58	16,265	16,265	1,768	1,768
11/24/13 14:53	1.6	5.98	35.31	16,157	16,157	1,819	1,819
11/24/13 14:54	1.5	6	35.31	15,198	15,198	1,761	1,761
11/24/13 14:55	1.6	5.83	35.31	15,752	15,752	1,819	1,819

11/24/13 14:56	1.5	5.77	35.31	14,615	14,615	1,761	1,761
11/24/13 14:57	1.4	5.87	35.31	13,877	13,877	1,703	1,703
11/24/13 14:58	1.5	5.93	35.31	15,021	15,021	1,722	1,722
11/24/13 14:59	1.6	5.88	35.31	15,887	15,887	1,800	1,800
11/24/13 15:00	1.6	5.83	35.68	15,752	15,752	1,859	1,859
11/24/13 15:01	1.5	5.86	35.87	14,843	14,843	1,790	1,790
11/24/13 15:02	1.5	5.96	35.87	15,097	15,097	1,770	1,770
11/24/13 15:03	1.5	5.97	35.87	15,122	15,122	1,810	1,810
11/24/13 15:04	1.6	5.95	35.87	16,076	16,076	1,849	1,849
11/24/13 15:05	1.5	5.9	35.87	14,945	14,945	1,829	1,829
11/24/13 15:06	1.6	5.86	35.87	15,833	15,833	1,869	1,869
11/24/13 15:07	1.6	5.76	35.87	15,563	15,563	1,829	1,829
11/24/13 15:08	1.5	5.86	34.86	14,843	14,843	1,766	1,766
11/24/13 15:09	1.6	5.8	34.86	15,671	15,671	1,862	1,862
11/24/13 15:10	1.6	5.75	34.86	15,536	15,536	1,882	1,882
11/24/13 15:11	1.6	5.78	34.86	15,617	15,617	1,805	1,805
11/24/13 15:12	1.5	5.69	34.86	14,413	14,413	1,786	1,786
11/24/13 15:13	1.6	5.67	34.86	15,319	15,319	1,824	1,824
11/24/13 15:14	1.6	5.72	34.86	15,455	15,455	1,901	1,901
11/24/13 15:15	1.7	5.69	34.8	16,334	16,334	1,957	1,957
11/24/13 15:16	1.6	5.53	34.68	14,941	14,941	1,800	1,800
11/24/13 15:17	0.8	5.38	34.68	7,268	7,268	900	900
11/24/13 15:18	0.9	5.46	34.68	8,298	8,298	1,053	1,053
11/24/13 15:19	0.2	5.28	34.68	1,783	1,783	211	211
11/24/13 15:20	0.2	4.94	34.68	1,668	1,668	230	230
11/24/13 15:21	0.2	4.81	34.68	1,624	1,624	211	211
11/24/13 15:22	0.8	4.72	34.68	6,376	6,376	1,072	1,072
11/24/13 15:23	0	4.81	34.5	0	0	0	0
11/24/13 15:24	0	4.98	34.32	0	0	0	0
11/24/13 15:25	0.8	5.29	34.32	7,146	7,146	911	911
11/24/13 15:26	0	5.65	34.32	0	0	0	0
11/24/13 15:27	0	5.82	34.32	0	0	0	0
11/24/13 15:28	0.2	5.92	34.32	1,999	1,999	209	209
11/24/13 15:29	0.2	5.95	34.32	2,009	2,009	209	209
11/24/13 15:30	0.4	5.9	34.32	3,985	3,985	417	417
11/24/13 15:31	0.6	5.74	34.31	5,816	5,816	659	659
11/24/13 15:32	0.6	5.88	34.31	5,958	5,958	621	621
11/24/13 15:33	0.6	5.98	34.31	6,059	6,059	659	659
11/24/13 15:34	0.6	5.98	34.31	6,059	6,059	621	621
11/24/13 15:35	0.6	5.98	34.31	6,059	6,059	621	621
11/24/13 15:36	0.7	6.04	34.31	7,140	7,140	790	790
11/24/13 15:37	0.7	6.03	34.31	7,128	7,128	828	828
11/24/13 15:38	0.9	5.85	34.16	8,891	8,891	841	841
11/24/13 15:39	1	5.76	33.44	9,727	9,727	1,062	1,062
11/24/13 15:40	1	5.93	33.44	10,014	10,014	1,081	1,081
11/24/13 15:41	0.8	6.02	33.44	8,133	8,133	824	824
11/24/13 15:42	0.9	6.17	33.44	9,377	9,377	1,026	1,026
11/24/13 15:43	1	6.15	33.44	10,385	10,385	1,246	1,246
11/24/13 15:44	1	5.91	33.44	9,980	9,980	1,154	1,154
11/24/13 15:45	1.1	5.86	33.44	10,885	10,885	1,246	1,246
11/24/13 15:46	1.1	5.9	33.61	10,959	10,959	1,196	1,196
11/24/13 15:47	1	5.9	33.78	9,963	9,963	1,164	1,164
11/24/13 15:48	1.1	6.07	33.78	11,275	11,275	1,256	1,256
11/24/13 15:49	1.2	6	33.78	12,158	12,158	1,312	1,312
11/24/13 15:50	1.1	5.76	33.78	10,699	10,699	1,256	1,256
11/24/13 15:51	1.1	5.82	33.78	10,811	10,811	1,256	1,256
11/24/13 15:52	1.1	5.88	33.78	10,922	10,922	1,201	1,201
11/24/13 15:53	1.2	6.05	33.78	12,260	12,260	1,275	1,275
11/24/13 15:54	1.1	5.93	33.85	11,015	11,015	1,219	1,219
11/24/13 15:55	1.1	5.92	33.88	10,997	10,997	1,163	1,163
11/24/13 15:56	1.1	6.11	33.88	11,349	11,349	1,200	1,200
11/24/13 15:57	1.2	6.08	33.88	12,320	12,320	1,329	1,329
11/24/13 15:58	1.1	5.74	33.88	10,662	10,662	1,237	1,237
11/24/13 15:59	1.1	5.65	33.88	10,495	10,495	1,237	1,237
11/24/13 16:00	1.2	5.9	33.88	11,956	11,956	1,292	1,292
11/24/13 16:01	1.1	5.98	33.88	11,108	11,108	1,255	1,255
11/24/13 16:02	1.2	5.93	34.34	12,016	12,016	1,403	1,403
11/24/13 16:03	1.2	5.89	34.34	11,935	11,935	1,384	1,384
11/24/13 16:04	1.2	5.99	34.34	12,138	12,138	1,309	1,309
11/24/13 16:05	1.2	6.08	34.34	12,320	12,320	1,384	1,384

11/24/13 16:06	1.3	5.9	34.34	12,952	12,952	1,459	1,459
11/24/13 16:07	1.3	5.54	34.34	12,162	12,162	1,421	1,421
11/24/13 16:08	1.2	5.6	34.34	11,348	11,348	1,328	1,328
11/24/13 16:09	1.1	5.81	34.4	10,792	10,792	1,257	1,257
11/24/13 16:10	1.2	6.1	34.41	12,361	12,361	1,295	1,295
11/24/13 16:11	1.1	6.01	34.41	11,164	11,164	1,258	1,258
11/24/13 16:12	1.1	5.89	34.41	10,941	10,941	1,239	1,239
11/24/13 16:13	1.1	5.88	34.41	10,922	10,922	1,239	1,239
11/24/13 16:14	1	5.96	34.41	10,064	10,064	1,108	1,108
11/24/13 16:15	1	5.66	34.41	9,558	9,558	1,070	1,070
11/24/13 16:16	1	5.48	34.65	9,254	9,254	1,072	1,072
11/24/13 16:17	0.7	5.6	35.87	6,620	6,620	968	968
11/24/13 16:18	0.1	5.76	35.87	973	973	0	
11/24/13 16:19	0	5.83	35.87	0		0	
11/24/13 16:20	0.2	5.78	35.87	1,952	1,952	209	209
11/24/13 16:21	0.6	5.63	35.87	5,704	5,704	684	684
11/24/13 16:22	0.1	5.44	35.87	919	919	95	95
11/24/13 16:23	0	5.32	35.87	0		0	
11/24/13 16:24	0	5.4	35.55	0		0	
11/24/13 16:25	0	5.64	34.92	0		0	
11/24/13 16:26	0	5.68	34.92	0		0	
11/24/13 16:27	0.2	5.48	34.92	1,851	1,851	182	182
11/24/13 16:28	0.2	5.4	34.92	1,824	1,824	200	200
11/24/13 16:29	0	5.3	34.92	0		0	
11/24/13 16:30	0	5.33	34.92	0		0	
11/24/13 16:31	0	5.59	34.92	0		0	
11/24/13 16:32	0	5.65	31.81	0		0	
11/24/13 16:33	0	5.64	30.26	0		0	
11/24/13 16:34	0	5.48	30.26	0		0	
11/24/13 16:35	0	5.57	30.26	0		0	
11/24/13 16:36	0	5.51	30.26	0		0	
11/24/13 16:37	0	5.37	30.26	0		0	
11/24/13 16:38	0	5.41	30.26	0		0	
11/24/13 16:39	0	5.36	30.26	0		0	
11/24/13 16:40	0	5.38	25.94	0		0	
11/24/13 16:41	0	5.3	25.94	0		0	
11/24/13 16:42	0	5.12	25.94	0		0	
11/24/13 16:43	0	5.12	25.94	0		0	
11/24/13 16:44	0	5.15	25.94	0		0	
11/24/13 16:45	0	5.1	25.94	0		0	
11/24/13 16:46	0	5.27	25.94	0		0	
11/24/13 16:47	0	5.26	25.2	0		0	
11/24/13 16:48	0	5.4	23.72	0		0	
11/24/13 16:49	0	5.48	23.72	0		24	24
11/24/13 16:50	0.1	5.42	23.72	915	915	70	70
11/24/13 16:51	0.1	5.33	23.72	900	900	70	70
11/24/13 16:52	0.1	5.13	23.72	866	866	59	59
11/24/13 16:53	0	4.84	23.72	0		0	
11/24/13 16:54	0	4.5	23.72	0		12	12
11/24/13 16:55	0	4.24	24.2	0		35	35
11/24/13 16:56	0	4.08	24.68	0		0	
11/24/13 16:57	0	4.02	24.68	0		0	
11/24/13 16:58	0	4.14	24.68	0		0	
11/24/13 16:59	0	4.26	24.68	0		0	
11/24/13 17:00	0	4.2	24.68	0		0	
11/24/13 17:01	0	3.95	24.68	0		0	
11/24/13 17:02	0	3.82	24.68	0		0	
11/24/13 17:03	0	3.86	20.12	0		0	
<b>Total</b>	<b>9.4</b>			<b>Total SO2 (lbs)</b>	<b>111,478</b>		<b>10,658</b>
				<b>Total H2S (lbs)</b>	<b>1,184</b>		

**Appendix 6d – Flare Incident – VRU Flare  
December 31, 2013**



## Flaring Event or SRP Event RCFA Investigation Report Template

Event Type (App D ¶ 53 or 40 CFR 60.108a(c)(6) as applicable)

### Flare Event

Flare Involved: VRU Flare

### RCFA Driver:

- ☒ Consent Decree (DDU Flare, 4UF Flare, UIU Flare, VRU Flare, FCU Flare, Alky Flare, LPG Flare)
- ☐ NSPS Subpart Ja (South Flare, GOHT Flare)

### Threshold Exceeded

- ☒ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period
- ☐ 500 lbs SO<sub>2</sub> discharge to the atmosphere in any 24 hour period due to Acid Gas or Sour Water Stripper Gas Flaring
- ☐ 500,000 standard cubic feet (scf) above the baseline in any 24 hour period [for South Flare and GOHT Flare Only]

### Sulfur Recovery Plant

250 ppm SO<sub>2</sub> limit exceedances, if the SO<sub>2</sub> discharge to the atmosphere is 500 lbs greater than the amount that would have been emitted if the emission limits have been met.

☐

Event Data (App. D ¶ 54a. and b. or 40 CFR 60.108a(c)(6)(ii)-(viii) as applicable)

Date	12/31/2013
Start Time	18:33
End time	20:56
Volume of Gas flared or Combusted*	272 Mscf
Quantity of SO <sub>2</sub> emitted**	563 lbs.
Quantity of VOC emitted***	296 lbs.

\* Standard conditions = 60° F.

\*\* Assumes 98% H<sub>2</sub>S converted to SO<sub>2</sub>

\*\*\* Assumes 98% of VOC destroyed



### Supporting Data and Calculations

**Quantity Resulting From Event: (Include details and assumptions used in the calculation including volumes and pollutant concentrations of gas. Use additional space as necessary.)**

#### Assumptions/Data Sources

- 1) Flare flow is measured by the flare header waste gas flow meter (F01908CR), but excludes flow associated with inert gases as defined in the "Waste Gas" definition of Appendix D of the consent decree (2:12 CV 00207)
- 2) The SO<sub>2</sub> is calculated using Equation 2 from Appendix FLR-18 from the Consent Decree (2:12 CV 00207).
- 3) Equation 2 uses the total sulfur analyzer measurements (A01907A/B), the final waste gas flow (F01908CR) with inerts excluded, and a unit conversion factor (0.169 or 64/379).
- 4) The VOC is based on a similar application of Equation 2, but replacing the total sulfur concentration with a VOC concentration as measured by the flare header gas chromatograph.

The spreadsheet below contains the waste gas flow, total sulfur concentration, VOC concentration, SO<sub>2</sub> emissions, and VOC emissions. The data is exported from the Continuous Emissions Monitoring System server, which is the repository for this information. The results of the SO<sub>2</sub> and VOC emissions are as calculated in the server.



Dec 31 Emission  
Calcs v3.xlsx

### Mitigation Steps Taken (App D.54.c.or/ 40 CFR 60.108a(c)(6)(viii) as applicable)

**Identify the steps taken to limit the duration of the event, the volume of gas flared or combusted, and the quantity of SO<sub>2</sub> and VOC emissions.**

Prior to the flaring event, the Shift Optimization Specialist noted there was an unexpected increase in the level of light slop in drum D-310 at VRU 300. The Shift Optimization Specialist put out a refinery wide call for units to check connections to this system and ensure no excess liquids were being sent to D-310.

Troubleshooting of the level increase in light slop drum D-310 by VRU 300 Operations led to the discovery that there was a frozen discharge meter for K-340 compressor and that the surge controller for the K-340 compressor was in recycle trip, which is when the recycle valve opens 100% (causing wet gas to pressure up in the header to the VRU flare). The surge controller was switched into manual control enabling wet gas header pressures to be brought back into balance ending the flaring event.

### Process Units Involved: (App D.54.d. or 40 CFR 60.108a(c)(6)(ix)(as applicable)

**Identification of the process unit/s involved in causing, or suspected of having caused, the event. (Use additional space as necessary.)**

12Pipestill Complex - VRU 300 Compressor K-340 discharge meter.



**BP Whiting Business Unit  
Environmental Management System Procedure Manual**

**Document Level:** 3  
**Document Number:** EF0008.1  
**Document Review Date:** 04/03/13  
**Document Revision Date:** 04/03/13  
**Document Revision #** 0

**Root and Contributing Causes (App D.54.d. or 40 CFR 60.108a(c)(6)(ix) (as applicable)**

**Describe in detail the cause and the circumstances that lead to the event. (Use additional space as necessary.)**

Freeze protection on the discharge meter FT33423 proved inadequate to prevent freezing given the extremely low temperatures and wind chills. Freeze-up of that meter was the root cause of the VRU flaring event.

**Corrective Measures Undertaken or To Be Undertaken (App D.54.e. or 40 CFR 60.108a(c)(6)(x) as applicable)**

**Describe the corrective measures undertaken and/or to be undertaken to avoid such an event in the future. Include schedule (including proposed commencement and completion dates) for corrective actions not completed with 45 days. If no corrective actions should be conducted, explain basis for conclusion. (Use additional space as necessary.)**

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
Thaw FT33423 discharge control meter and maintain temperature with steam.	Yes (1/2/2014)		
Install additional insulation and heat tracing on the FT33423 discharge control meter.	No – SAP Notification #000040090080 created.	1/9/2014	2/5/2014

**Report Submitted by (Investigation Team):**

Jim Madison, Area Environmental Specialist (Team Lead)

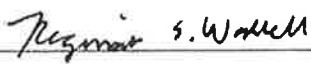
Chris Vodicka, Process Engineering

Jared Stewart, Shift Supervisor

Marie Rozzos, Operations OSB

Brandon Mik, Flare SME

**Report Approved By:**

		10-Feb-2014
Reginald Waddell, Operations Superintendent		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in the semi-annual report due under Part VIII and in the NSPS Ja report, as applicable.

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## **Supporting Data and Calculations**

	Waste Gas Flow Excluding Inerts	Total Sulfur	Total Sulfur	SO2	VOC	VOC	VOC
DATE/TIME	(scfh)	(mol%)	(ppm)	(lb/hr)	(mol%)	(ppm)	(lb/hr)
12/31/13 18:33	74,208	0.009	90	2.5	11.2	112,000	32.9
12/31/13 18:34	121,044	0.009	90	4.1	11.2	112,000	53.4
12/31/13 18:35	148,128	0.01	100	5.5	11.16	111,600	65
12/31/13 18:36	131,298	0.042	420	20.1	11.12	111,200	57.4
12/31/13 18:37	111,258	0.21	2,100	83.7	11.12	111,200	48.7
12/31/13 18:38	96,492	0.464	4,640	168.1	11.12	111,200	42.2
12/31/13 18:39	98,976	0.362	3,620	133.3	11.12	111,200	43.3
12/31/13 18:40	113,712	1.078	10,780	458.4	11.12	111,200	49.9
12/31/13 18:41	142,770	0.586	5,860	314.1	11.12	111,200	62.6
12/31/13 18:42	141,528	0.469	4,690	251	11.12	111,200	61.9
12/31/13 18:43	133,338	0.45	4,500	226.1	11.01	110,100	58
12/31/13 18:44	131,550	0.482	4,820	238.9	10.95	109,500	57
12/31/13 18:45	135,504	0.555	5,550	283.3	10.95	109,500	58.7
12/31/13 18:46	133,296	0.591	5,910	297.6	10.95	109,500	57.7
12/31/13 18:47	123,936	0.614	6,140	286.9	10.95	109,500	53.7
12/31/13 18:48	120,096	0.67	6,700	303.8	10.95	109,500	52
12/31/13 18:49	127,212	0.751	7,510	361.1	10.95	109,500	55.1
12/31/13 18:50	140,976	0.792	7,920	421.4	10.95	109,500	61.1
12/31/13 18:51	183,078	0.831	8,310	420.2	23.78	237,800	197.2
12/31/13 18:52	160,032	0.9	9,000	398.6	23.78	237,800	172.4
12/31/13 18:53	147,336	1.014	10,140	412.2	23.78	237,800	158.8
12/31/13 18:54	144,024	1.033	10,330	411.9	23.78	237,800	155.1
12/31/13 18:55	148,980	1.005	10,050	414.6	23.78	237,800	161.2
12/31/13 18:56	188,268	0.968	9,680	504.5	23.78	237,800	202.8
12/31/13 18:57	157,020	0.957	9,570	415.9	23.78	237,800	169.2
12/31/13 18:58	95,700	0.946	9,460	243.8	26.55	265,500	110.6
12/31/13 18:59	75,618	0.957	9,570	180.2	32.1	321,000	103.5
12/31/13 19:00	161,166	0.961	9,610	384.7	32.1	321,000	222
12/31/13 19:01	191,376	0.897	8,970	427	32.1	321,000	259.8
12/31/13 19:02	180,060	0.897	8,970	401.8	32.1	321,000	244.4
12/31/13 19:03	208,344	0.977	9,770	504.9	32.1	321,000	282.8
12/31/13 19:04	181,002	1.072	10,720	482.3	32.1	321,000	245.7
12/31/13 19:05	213,690	1.125	11,250	597.8	32.1	321,000	290.1
12/31/13 19:06	191,172	1.211	12,110	576.8	30.78	307,800	248.3
12/31/13 19:07	177,432	1.204	12,040	534.8	30.12	301,200	226.3
12/31/13 19:08	205,194	1.173	11,730	602.5	30.12	301,200	260
12/31/13 19:09	182,100	1.116	11,160	508.5	30.12	301,200	230.8
12/31/13 19:10	176,322	1.086	10,860	478.5	30.12	301,200	223.4
12/31/13 19:11	205,944	1.078	10,780	554.7	30.12	301,200	261
12/31/13 19:12	188,316	1.056	10,560	497.2	30.12	301,200	238.4
12/31/13 19:13	189,702	1.045	10,450	494.3	30.12	301,200	240.4
12/31/13 19:14	210,708	1.053	10,530	541.9	29.36	293,600	253.3
12/31/13 19:15	196,092	1.056	10,560	505.6	29.36	293,600	235.6
12/31/13 19:16	190,572	1.051	10,510	489.5	29.36	293,600	229.2
12/31/13 19:17	189,210	1.069	10,690	494.4	29.36	293,600	227.5
12/31/13 19:18	213,288	1.096	10,960	571.2	29.36	293,600	257.7
12/31/13 19:19	202,500	1.1	11,000	544.3	29.36	293,600	243.4
12/31/13 19:20	186,018	1.129	11,290	512.9	29.36	293,600	223.6
12/31/13 19:21	177,612	1.172	11,720	510.2	29.61	296,100	216.2
12/31/13 19:22	168,726	1.228	12,280	518.4	30.83	308,300	218.4
12/31/13 19:23	164,742	1.259	12,590	518.1	30.83	308,300	213.5
12/31/13 19:24	163,602	1.257	12,570	514.2	30.83	308,300	212
12/31/13 19:25	162,702	1.247	12,470	507.8	30.83	308,300	210.8
12/31/13 19:26	163,896	1.223	12,230	501	30.83	308,300	212.4
12/31/13 19:27	167,070	1.202	12,020	501.8	30.83	308,300	216.5
12/31/13 19:28	211,638	1.166	11,660	617.2	30.83	308,300	274.7
12/31/13 19:29	192,720	1.156	11,560	556.3	31.64	316,400	257.4
12/31/13 19:30	166,584	1.179	11,790	489.7	32.45	324,500	230.1
12/31/13 19:31	155,046	1.244	12,440	480.2	32.45	324,500	214.1
12/31/13 19:32	159,528	1.339	13,390	533.8	32.45	324,500	220.6
12/31/13 19:33	169,302	1.317	13,170	557.2	32.45	324,500	233.8
12/31/13 19:34	160,788	1.189	11,890	477.5	32.45	324,500	222.1
12/31/13 19:35	154,686	1.042	10,420	404.6	32.45	324,500	213.6
12/31/13 19:36	160,974	0.926	9,260	371.8	32.45	324,500	222.3
12/31/13 19:37	171,096	0.945	9,450	397.4	30.48	304,800	213.3
12/31/13 19:38	159,168	1	10,000	390.3	30.09	300,900	194
12/31/13 19:39	154,656	0.988	9,880	374.9	30.09	300,900	188.5
12/31/13 19:40	153,024	0.964	9,640	361.5	30.09	300,900	186.5
12/31/13 19:41	153,624	0.957	9,570	360.1	30.09	300,900	187.5
12/31/13 19:42	153,618	0.936	9,360	352.7	30.09	300,900	187.3
12/31/13 19:43	151,752	0.868	8,680	323.3	30.09	300,900	185

12/31/13 19:44	152,064	0.814	8,140	304	30.08	300,800	185.5
12/31/13 19:45	150,396	0.785	7,850	293.9	30.05	300,500	184
12/31/13 19:46	147,864	0.778	7,780	286	30.05	300,500	181
12/31/13 19:47	147,606	0.769	7,690	281.8	30.05	300,500	180.7
12/31/13 19:48	146,994	0.741	7,410	270.6	30.05	300,500	179.9
12/31/13 19:49	169,416	0.732	7,320	308.4	30.05	300,500	208
12/31/13 19:50	163,482	0.719	7,190	292.1	30.05	300,500	200.1
12/31/13 19:51	150,450	0.733	7,330	274	30.05	300,500	184.1
12/31/13 19:52	144,564	0.75	7,500	270.4	30.36	303,600	178.7
12/31/13 19:53	147,930	0.785	7,850	291.1	30.68	306,800	186.6
12/31/13 19:54	165,174	0.829	8,290	343.4	30.68	306,800	208.2
12/31/13 19:55	147,114	0.8	8,000	295.3	30.68	306,800	185.1
12/31/13 19:56	123,342	0.74	7,400	229.8	30.68	306,800	155.6
12/31/13 19:57	100,398	0.693	6,930	174.4	30.68	306,800	126.6
12/31/13 19:58	85,416	0.751	7,510	160.4	30.68	306,800	107.2
12/31/13 19:59	74,196	0.742	7,420	138.4	30.68	306,800	93.4
12/31/13 20:00	65,724	0.64	6,400	105.8	31.15	311,500	85.1
12/31/13 20:01	62,922	0.483	4,830	76.7	31.24	312,400	82
12/31/13 20:02	59,790	0.291	2,910	44.1	31.24	312,400	77.8
12/31/13 20:03	58,062	0.213	2,130	31.1	31.24	312,400	75.6
12/31/13 20:04	59,868	0.033	330	5.4	31.24	312,400	77.9
12/31/13 20:05	59,556	0.158	1,580	22.3	31.24	312,400	77.5
12/31/13 20:06	56,334	0.494	4,940	69.7	31.24	312,400	73.3
12/31/13 20:07	58,788	0.352	3,520	51.8	31.24	312,400	76.9
12/31/13 20:08	57,504	0.889	8,890	126.5	31.02	310,200	73.8
12/31/13 20:09	60,840	0.174	1,740	27.2	31.02	310,200	78.1
12/31/13 20:10	59,442	0.083	830	12.2	31.02	310,200	76.3
12/31/13 20:11	58,338	0.177	1,770	25.8	31.02	310,200	74.9
12/31/13 20:12	62,172	0.188	1,880	29.3	31.02	310,200	79.8
12/31/13 20:13	61,416	0.183	1,830	28.1	31.02	310,200	78.8
12/31/13 20:14	63,318	0.161	1,610	25.4	31.02	310,200	81.3
12/31/13 20:15	58,932	0.138	1,380	21.6	28.05	280,500	70.2
12/31/13 20:16	51,582	0.122	1,220	19.4	22.1	221,000	49.7
12/31/13 20:17	49,656	0.109	1,090	16.6	22.1	221,000	47.8
12/31/13 20:18	49,146	0.097	970	14.7	22.1	221,000	47.4
12/31/13 20:19	49,488	0.088	880	13.3	22.1	221,000	47.7
12/31/13 20:20	48,672	0.08	800	11.9	22.1	221,000	46.9
12/31/13 20:21	48,864	0.074	740	11	22.1	221,000	47.1
12/31/13 20:22	49,740	0.068	680	10.4	22.1	221,000	47.9
12/31/13 20:23	47,820	0.063	630	9.7	19.73	197,300	41.2
12/31/13 20:24	45,990	0.058	580	8.8	18.55	185,500	37.1
12/31/13 20:25	46,320	0.054	540	8.3	18.55	185,500	37.2
12/31/13 20:26	45,834	0.051	510	7.8	18.55	185,500	37
12/31/13 20:27	46,092	0.051	510	7.8	18.55	185,500	37.2
12/31/13 20:28	46,578	0.05	500	7.8	18.55	185,500	37.6
12/31/13 20:29	45,468	0.049	490	7.4	18.55	185,500	36.7
12/31/13 20:30	45,126	0.048	480	7.2	18.55	185,500	36.6
12/31/13 20:31	44,346	0.046	460	7.2	15.54	155,400	29.4
12/31/13 20:32	44,070	0.044	440	6.8	15.54	155,400	29.2
12/31/13 20:33	42,918	0.042	420	6.3	15.54	155,400	28.5
12/31/13 20:34	43,614	0.04	400	6.1	15.54	155,400	28.9
12/31/13 20:35	43,458	0.038	380	5.8	15.54	155,400	28.8
12/31/13 20:36	41,832	0.037	370	5.4	15.54	155,400	27.8
12/31/13 20:37	44,010	0.036	360	5.6	15.54	155,400	29.2
12/31/13 20:38	43,362	0.036	360	5.5	15.38	153,800	28.6
12/31/13 20:39	40,302	0.037	370	5.4	15.06	150,600	25.7
12/31/13 20:40	39,648	0.039	390	5.5	15.06	150,600	25.2
12/31/13 20:41	40,920	0.04	400	5.8	15.06	150,600	26.1
12/31/13 20:42	41,004	0.04	400	5.8	15.06	150,600	26.1
12/31/13 20:43	40,032	0.039	390	5.6	15.06	150,600	25.5
12/31/13 20:44	39,900	0.038	380	5.4	15.06	150,600	25.4
12/31/13 20:45	40,944	0.035	350	5.1	15.06	150,600	26.1
12/31/13 20:46	38,628	0.033	330	4.6	14.19	141,900	22.9
12/31/13 20:47	38,940	0.032	320	4.5	13.75	137,500	22.2
12/31/13 20:48	39,588	0.03	300	4.3	13.75	137,500	22.5
12/31/13 20:49	37,566	0.028	280	3.8	13.75	137,500	21.4
12/31/13 20:50	38,448	0.027	270	3.7	13.75	137,500	21.9
12/31/13 20:51	37,578	0.026	260	3.5	13.75	137,500	21.4
12/31/13 20:52	38,568	0.025	250	3.4	13.75	137,500	22
12/31/13 20:53	38,910	0.022	220	3.2	13.75	137,500	22.2
12/31/13 20:54	38,610	0.02	200	2.8	13.78	137,800	22.1
12/31/13 20:55	37,902	0.018	180	2.4	13.79	137,900	21.7
12/31/13 20:56	37,434	0.016	160	2.1	13.79	137,900	21.4
Average During Event (Mscf/hr or lb/hr)		113,267		235			123
Total During Event (Mscf or lbs)		271.8		563			296

## **Appendix 7 – Dual-Bed Carbon Canister Completion Report**

## Appendix 7: Carbon Canister Project Completion Report CD ¶ 62.b.i

This report provides details of actions taken to comply with requirements of Paragraph 52.

### **Carbon Canister Report CD ¶ 52.**

#### **a. Dual Carbon Canisters/Beds.**

- i. Except as provided for in sub-paragraph 52.b, by no later than 12 months after the Date of Entry of the Consent Decree, BPP shall install primary and secondary carbon canisters and operate them in series (the “dual-canister” option). BPP may comply with the requirements of the dual canister option required under this sub-paragraph by using a single canister with a “dual carbon bed” if the dual carbon bed configuration allows for breakthrough monitoring between the primary and secondary beds in accordance with this sub-paragraph.”

The project to fulfill this requirement was completed by November 5, 2013. BPP has implemented the dual-bed carbon canisters as the standard carbon canister configuration throughout the refinery, except except as provided under ¶ 52.b.i.(4) for carbon canisters 87 through 98 at the Lakefront wastewater treatment plant. This dual-bed configuration also applies to these locations where the dual bed carbon canisters or dual canisters are not required per Consent Decree ¶ 52.b.i.(1) to 52.b.i.(3). A table is provided in the text of the BWON Semiannual report in section II CD ¶ 62.b.i. The table lists the locations of the dual-bed canisters, the dates switched from the single canisters or dual canisters and the dates in operation.

### **Carbon Canister Report CD ¶ 52.a.ii - iii**

- ii. Breakthrough monitoring. BPP shall conduct breakthrough monitoring between the primary and secondary carbon canisters or beds when there is actual flow to the carbon canister. Such monitoring shall be conducted in accordance with the frequency specified in 40 C.F.R. § 61.354(d) using as the design basis the applicable breakthrough definition specified in sub-paragraph 52.a.iii. If a carbon canister or bed becomes unsafe to monitor because it is located within a temporary exclusion zone, BPP shall monitor the canister or bed as soon as is practicable after the exclusion zone is no longer in effect, but in no case later than the end of the normal monitoring interval for the canister or bed or within 3 days of the end of the exclusion period, whichever is sooner. BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

- iii. Breakthrough definition. BPP may use either 50 ppmv VOC or 1 ppmv benzene as the design value for the primary carbon canister or bed. BPP shall immediately replace the primary carbon canister or bed when the design value for the primary canister or bed is exceeded (as monitored between the primary and secondary carbon canister or carbon bed). Unless both the primary and secondary carbon canisters or beds are replaced with fresh ones, the original secondary carbon canister or bed shall become the new primary carbon canister or bed and a

fresh secondary carbon canister or bed shall be installed. In all cases, any carbon canister or bed used as the primary unit shall have sufficient capacity to meet the breakthrough definition of this sub-paragraph. For purposes of this sub-paragraph 352.a., “immediately” means no later than within twenty-four (24) hours.

BPP have updated the procedures that incorporate the requirements of breakthrough monitoring and breakthrough definition. The monitoring technicians have been trained with the updated procedures. The unsafe to monitor canisters during the reporting period are provided in Appendix 8.c.

**Carbon Canister Report CD ¶ 52.a.iv**

iv. BPP shall maintain a sufficient supply of fresh carbon canisters and carbon beds at the Whiting Refinery at all times.

BPP have purchased 188 dual-bed carbon canisters that are custom designed and fit to the Whiting refinery’s application. 94 of the inventory are installed in the field. The remaining 94 canisters are either stocked on site as spares or en route for carbon reclamation. Among the 94 canister sites, only 16 are on the daily monitoring frequency. Based on the design-basis study, the majority of the canister sites are on breakthrough frequency of more than 60 days.

**Carbon Canister Report CD ¶ 52.a.v**

v. For any new waste management unit(s) or refinery process unit(s) at the Whiting Refinery where carbon canisters will be installed and used as the control device for complying with the Benzene Waste Operations NESHAP, BPP shall comply with the dual-canister option, except as provided in sub-paragraph 52.b.

All of the new waste management units or refinery process units at the Whiting Refinery where carbon canisters used as the control device have been installed with dual-bed carbon canisters. This requirement applies to the following canister sites in the new refinery process units as proved below.

ID	Location	ID	Location
35	12PS	107	GOHT
36	12PS	108	GOHT Flare
101	12PS	110A	LF
103	12PS	110B	LF
104	DDU	111A	LF
112	NSU	111B	LF
113	S FLARE	124	LF
114	Coker2	119	OSBL
ID	Location	ID	Location
115	Coker2	120	OSBL
116	Coker2	121	OSBL
117	Coker2	122	OSBL
118	Coker2		

**Carbon Canister Report CD ¶ 52.b.i.(1) to 52.b.i.(3)**

**b. Single Carbon Canisters.**

i. Permitted locations. After the Date of Entry, for any carbon canister at the Whiting Refinery subject to this Paragraph 52, BPP may use the “single canister” option described in this sub-paragraph at the following locations:

- (1) If BPP demonstrates that it is technologically infeasible or unsafe to comply with the dual-canister option under sub-paragraph 52.a, BPP may use a single carbon canister at that specific location. BPP shall submit a written request to EPA to comply with the “single canister” option for each such canister. This request shall specifically identify each carbon canister for which BPP claims that it is technologically infeasible or unsafe to comply with the dual-canister option and shall provide a detailed explanation of the specific technical and/or safety reasons for the request. This request shall be subject to EPA approval.
- (2) BPP may use a single carbon canister at locations where breakthrough, as defined in this sub-paragraph 52.b, has been documented as occurring less than once per calendar year.
- (3) BPP may use a single carbon canister on temporary waste management units (e.g., FRAC or Baker tanks), provided that such temporary units are used for no more than 30 Days.

The above referenced conditions do not apply to the Whiting Refinery because BPP has phased out all single canisters, except CC87 through CC98. In case Conditions (1) to (3) applies in the future, only the dual-bed carbon canisters will be supplied as the only available option.

**Carbon Canister Report CD ¶ 52.b.i.(4)**

(4) Until December 31, 2015, BPP may use single carbon canisters at the DAF unit and API Separator that are subject to sub-paragraph 60.g. Within 12 months after the Effective Date of Entry the Consent Decree and continuing until December 31, 2015, BPP shall optimize the use of bio-filters or other control or treatment technologies to minimize breakthrough at the single carbon canisters at the DAF and API Separator.

This condition applies to CC87 to CC98 where the single canisters are still in use.

**Carbon Canister Report CD ¶ 52.b.ii to 52.b.iii**

ii. Breakthrough monitoring. By no later than the Date of Entry, BPP shall conduct breakthrough monitoring for each single carbon canister at the Whiting Refinery when there is actual flow to the canister. Such monitoring shall be conducted in accordance with all requirements specified in 40 C.F.R. § 61.354(d) using as the design basis the applicable breakthrough definition specified in sub-paragraph 52.b.iii, but in no case less frequently than on a monthly basis. If a carbon canister or bed becomes unsafe to monitor because it is located within a temporary exclusion zone, BPP shall monitor the canister or bed as soon as is practicable after the exclusion zone is no longer in effect, but in no case later than the end of the normal monitoring interval for the canister or bed or within 3 days of the end of the exclusion period, whichever is sooner. BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

iii. Breakthrough definition. Single carbon canisters will be replaced immediately when breakthrough is detected as follows:

(1) For canisters less than or equal to 55-gallon drum size, breakthrough is any reading of VOC or benzene above background.

(2) For canisters larger than 55 gallons, breakthrough is defined as either:

a. 50 ppmv VOC; or

b. 1 ppmv benzene. To use 1 ppmv benzene, canisters must be monitored for VOC.

When a reading of 10 ppmv VOC is detected, monitoring for benzene must be conducted on the following schedule:

i. Daily if the representative historical replacement interval is two weeks or less, or

ii. Three times per week and not on consecutive days, if the representative historical replacement interval is greater than two weeks.

(3) For purposes of this sub-paragraph 52.b., the term “immediately” shall mean: within eight (8) hours for single canisters with representative historical replacement intervals of two weeks or less; or within twenty-four (24) hours for single canisters with a representative historical replacement interval of more than two weeks.

BPP have updated the procedures that incorporate the requirements of breakthrough monitoring and breakthrough definition. The monitoring technicians have been trained with the updated procedures. The unsafe to monitor canisters during the reporting period are provided in Appendix 8c.

**Carbon Canister Report CD ¶ 52.b.iv**

iv. Canister Replacement. Single carbon canisters may be replaced with a dual carbon canister or carbon bed system at any time provided EPA is notified and the monitoring requirements for single canisters are continued until the second canister or bed is installed. BPP shall comply with the monitoring requirements for dual-carbon canisters or dual-carbon beds provided in sub-paragraph 52.a upon installation of such system, and BPP shall notify EPA of such replacement in its next quarterly report submitted pursuant to Part VIII of the Consent Decree.

BPP has fulfilled this requirement. The details are provided in this report.

**Carbon Canister Report CD ¶ 52.c**

c. Alternative Control/Treatment Devices. Nothing in Paragraph 52 of this Section of the Consent Decree is intended to preclude BPP from electing to use other control devices at the Whiting Refinery to comply with the Benzene Waste Operations NESHAP instead of or in addition to carbon adsorption, provided that such other control technology meets all applicable control and/or treatment requirements under the Benzene Waste Operations NESHAP and the compliance monitoring point is unaffected by the use of such other control devices. If BPP elects to use another control technology, BPP shall submit written notification to EPA in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree providing both the location where such other control technology shall be used instead of or in addition to carbon adsorption and a description of the other technology to be used. .

BPP has not installed alternative control/treatment devices in the refinery's sewer system. Should there is a need to install the control/treatment devices other than the carbon canisters; we will submit written notification to EPA in its next semi-annual report.

## **Appendix 8a – 3<sup>rd</sup> Quarter 2013 Carbon Canister Report**

**Appendix 8a - BWON Single Carbon Canister Breakthrough Monitoring Report  
3RD Quarter 2013**

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	Time	Date	Time	
32	7/1/13	10:35	7/1/13	11:30	
92	7/1/13	12:15	7/1/13	13:45	
93	7/1/13	12:15	7/1/13	13:45	
96	7/1/13	12:15	7/1/13	13:45	
98	7/1/13	12:15	7/1/13	13:45	
32	7/2/13	11:20	7/2/13	13:05	
94	7/2/13	9:50	7/2/13	14:00	
95	7/2/13	9:50	7/2/13	14:00	
97	7/2/13	9:50	7/2/13	14:00	
32	7/3/13	8:40	7/3/13	10:55	
88	7/3/13	9:50	7/3/13	12:10	
89	7/3/13	9:50	7/3/13	12:10	
90	7/3/13	9:50	7/3/13	12:10	
91	7/3/13	9:50	7/3/13	12:10	
32	7/4/13	8:10	7/4/13	9:30	
32	7/5/13	9:20	7/5/13	10:45	
98	7/5/13	7:50	7/5/13	9:00	
32	7/6/13	9:25	7/6/13	13:10	
69	7/6/13	8:35	7/6/13	13:40	
92	7/6/13	7:50	7/6/13	11:20	
96	7/6/13	7:50	7/6/13	11:20	
93	7/7/13	6:40	7/7/13	7:45	
94	7/7/13	6:40	7/7/13	7:45	
95	7/7/13	6:40	7/7/13	7:45	
97	7/7/13	6:40	7/7/13	7:45	
32	7/8/13	10:40	7/8/13	11:45	
88	7/8/13	7:40	7/8/13	8:45	
89	7/8/13	7:40	7/8/13	8:45	
90	7/8/13	7:40	7/8/13	8:45	
91	7/8/13	7:40	7/8/13	8:45	
15	7/9/13	11:10	7/9/13	13:30	
18	7/9/13	11:19	7/9/13	13:30	
32	7/9/13	8:35	7/9/13	11:30	
66	7/9/13	9:05	7/9/13	15:00	
32	7/10/13	11:09	7/10/13	12:45	
92	7/10/13	7:45	7/10/13	9:00	
96	7/10/13	7:45	7/10/13	9:00	
97	7/10/13	7:45	7/10/13	9:00	
98	7/10/13	7:45	7/10/13	9:00	
90	7/11/13	8:30	7/11/13	10:45	
91	7/11/13	8:30	7/11/13	10:45	
94	7/11/13	8:30	7/11/13	10:45	
95	7/11/13	8:30	7/11/13	10:45	
32	7/11/13	10:50	7/11/13	13:30	
88	7/11/13	8:30	7/11/13	10:45	
89	7/11/13	8:30	7/11/13	10:45	
32	7/12/13	10:25	7/12/13	11:15	
93	7/12/13	8:20	7/12/13	9:30	
32	7/13/13	9:05	7/13/13	10:00	
92	7/13/13	7:18	7/13/13	8:30	
96	7/13/13	7:18	7/13/13	8:30	
32	7/14/13	9:53	7/14/13	10:20	
90	7/14/13	7:28	7/14/13	8:20	
94	7/14/13	7:28	7/14/13	8:20	
95	7/14/13	7:28	7/14/13	8:20	
97	7/14/13	7:28	7/14/13	8:20	
98	7/14/13	7:28	7/14/13	8:20	
32	7/15/13	9:00	7/15/13	10:45	
88	7/15/13	10:30	7/15/13	11:15	
89	7/15/13	10:30	7/15/13	11:15	
91	7/15/13	10:30	7/15/13	11:15	
93	7/15/13	10:30	7/15/13	11:15	
123 (DURATHERM)	7/15/13	10:30	7/15/13	11:15	
32	7/16/13	11:01	7/16/13	12:00	
96	7/16/13	8:15	7/16/13	10:40	
32	7/17/13	11:40	7/17/13	12:45	
90	7/17/13	8:54	7/17/13	10:25	
92	7/17/13	8:54	7/17/13	10:25	
94	7/17/13	8:54	7/17/13	10:25	
95	7/17/13	8:54	7/17/13	10:25	

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	Time	Date	Time	
97	7/17/13	8:54	7/17/13	10:25	
98	7/17/13	8:54	7/17/13	10:25	
32	7/18/13	10:22	7/18/13	11:50	
88	7/18/13	11:40	7/18/13	14:00	
89	7/18/13	11:40	7/18/13	14:00	
91	7/18/13	11:40	7/18/13	14:00	
93	7/18/13	11:40	7/18/13	14:00	
96	7/18/13	11:40	7/18/13	14:00	
32	7/19/13	9:40	7/19/13	13:15	
34	7/19/13	10:10	7/19/13	12:45	
90	7/19/13	8:45	7/19/13	9:40	
92	7/19/13	8:45	7/19/13	9:40	
94	7/19/13	8:45	7/19/13	9:40	
95	7/19/13	8:45	7/19/13	9:40	
97	7/19/13	8:45	7/19/13	9:40	
98	7/19/13	8:45	7/19/13	9:40	
32	7/20/13	9:03	7/20/13	12:50	
123					
(DURATHERM)	7/20/13	7:15	7/20/13	8:55	
32	7/21/13	8:38	7/21/13	10:45	
88	7/21/13	7:09	7/21/13	8:30	
89	7/21/13	7:09	7/21/13	8:30	
91	7/21/13	7:09	7/21/13	8:30	
96	7/21/13	7:09	7/21/13	8:30	
32	7/22/13	11:00	7/22/13	11:05	
90	7/22/13	7:50	7/22/13	9:50	
93	7/22/13	7:50	7/22/13	9:50	
94	7/22/13	7:50	7/22/13	9:50	
97	7/22/13	7:50	7/22/13	9:50	
32	7/23/13	10:30	7/23/13	12:00	
92	7/23/13	7:35	7/23/13	10:20	
95	7/23/13	7:35	7/23/13	10:20	
98	7/23/13	7:35	7/23/13	10:20	
32	7/24/13	7:44	7/24/13	9:00	
86	7/24/13	8:05	7/24/13	9:55	
123					
(DURATHERM)	7/24/13	8:05	7/24/13	10:10	
32	7/25/13	10:45	7/25/13	11:45	
91	7/25/13	9:00	7/25/13	11:15	
96	7/25/13	9:00	7/25/13	11:15	
32	7/26/13	10:45	7/26/13	13:20	
88	7/26/13	8:20	7/26/13	9:45	
90	7/26/13	8:20	7/26/13	9:45	
93	7/26/13	8:20	7/26/13	9:45	
94	7/26/13	8:20	7/26/13	9:45	
32	7/27/13	8:05	7/27/13	12:10	
97	7/27/13	6:30	7/27/13	10:45	
32	7/28/13	8:15	7/28/13	10:05	
92	7/28/13	6:50	7/28/13	7:30	
95	7/28/13	6:50	7/28/13	7:30	
98	7/28/13	6:50	7/28/13	7:30	
123					
(DURATHERM)	7/28/13	6:50	7/28/13	7:30	
32	7/29/13	10:01	7/29/13	14:00	
88	7/29/13	8:00	7/29/13	10:00	
89	7/29/13	8:00	7/29/13	10:00	
91	7/29/13	8:00	7/29/13	10:00	
93	7/29/13	8:00	7/29/13	10:00	
96	7/29/13	8:00	7/29/13	10:00	
32	7/30/13	11:15	7/30/13	13:00	
90	7/30/13	9:00	7/30/13	10:00	
94	7/30/13	9:00	7/30/13	10:00	
95	7/30/13	9:00	7/30/13	10:00	
97	7/30/13	9:00	7/30/13	10:00	
98	7/30/13	9:00	7/30/13	10:00	
32	7/31/13	10:40	7/31/13	14:05	
88	7/31/13	8:40	7/31/13	11:15	
89	7/31/13	8:40	7/31/13	11:15	
91	7/31/13	8:40	7/31/13	11:15	
92	7/31/13	8:40	7/31/13	11:15	
93	7/31/13	8:40	7/31/13	11:15	
96	7/31/13	8:40	7/31/13	11:15	
32	8/1/13	10:25	8/1/13	13:45	
76	8/1/13	UNIT	8/1/13		

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	<i>Date</i>	<i>Time</i>	<i>Date</i>	<i>Time</i>	
90	8/1/13	11:00	8/1/13	11:00	
94	8/1/13	11:00	8/1/13	11:00	
95	8/1/13	11:00	8/1/13	11:00	
97	8/1/13	11:00	8/1/13	11:00	
98	8/1/13	11:00	8/1/13	11:00	
6	8/2/13	10:15	8/2/13	11:15	
32	8/2/13	9:55	8/2/13	10:45	
88	8/2/13	7:12	8/2/13	8:10	
89	8/2/13	7:12	8/2/13	8:10	
91	8/2/13	7:12	8/2/13	8:10	
92	8/2/13	7:12	8/2/13	8:10	
93	8/2/13	7:12	8/2/13	8:10	
96	8/2/13	7:12	8/2/13	8:10	
32	8/3/13	9:03	8/3/13	12:30	
90	8/3/13	6:44	8/3/13	9:45	
94	8/3/13	6:44	8/3/13	9:45	
95	8/3/13	6:44	8/3/13	9:45	
97	8/3/13	6:44	8/3/13	9:45	
98	8/3/13	6:44	8/3/13	9:45	
123 (DURATHERM)	8/3/13	6:44	8/3/13	9:45	
32	8/4/13	8:56	8/4/13	10:10	
88	8/4/13	6:45	8/4/13	8:30	
89	8/4/13	6:45	8/4/13	8:30	
91	8/4/13	6:45	8/4/13	8:30	
92	8/4/13	6:45	8/4/13	8:30	
93	8/4/13	6:45	8/4/13	8:30	
96	8/4/13	6:45	8/4/13	8:30	
32	8/5/13	12:05	8/5/13	1:30	
90	8/5/13	8:05	8/5/13	9:00	
94	8/5/13	8:05	8/5/13	9:00	
95	8/5/13	8:05	8/5/13	9:00	
97	8/5/13	8:05	8/5/13	9:00	
98	8/5/13	8:05	8/5/13	9:00	
32	8/6/13	10:44	8/6/13	1:50	
88	8/6/13	9:12	8/6/13	10:00	
89	8/6/13	9:12	8/6/13	10:00	
91	8/6/13	9:12	8/6/13	10:00	
92	8/6/13	9:12	8/6/13	10:00	
93	8/6/13	9:12	8/6/13	10:00	
96	8/6/13	9:12	8/6/13	10:00	
32	8/7/13	10:38	8/7/13	12:00	
90	8/7/13	7:44	8/7/13	10:00	
94	8/7/13	7:44	8/7/13	10:00	
95	8/7/13	7:44	8/7/13	10:00	
97	8/7/13	7:44	8/7/13	10:00	
98	8/7/13	7:44	8/7/13	10:00	
32	8/8/13	9:40	8/8/13	1:30	
88	8/8/13	8:00	8/8/13	11:20	
89	8/8/13	8:00	8/8/13	11:20	
91	8/8/13	8:00	8/8/13	11:20	
123 (DURATHERM)	8/8/13	7:54	8/8/13	11:20	
32	8/9/13	10:15	8/9/13	1:50	
45	8/9/13	11:14	8/9/13	1:50	
92	8/9/13	7:15	8/9/13	8:40	
93	8/9/13	7:15	8/9/13	8:40	
96	8/9/13	7:15	8/9/13	8:40	
97	8/9/13	7:15	8/9/13	8:40	
32	8/10/13	9:23	8/10/13	1:30	
88	8/10/13	7:24	8/10/13	9:00	
90	8/10/13	7:24	8/10/13	9:00	
94	8/10/13	7:24	8/10/13	9:00	
95	8/10/13	7:24	8/10/13	9:00	
98	8/10/13	7:24	8/10/13	9:00	
32	8/11/13	8:28	8/11/13	9:20	
89	8/11/13	7:30	8/11/13	7:45	
91	8/11/13	7:30	8/11/13	7:45	
32	8/12/13	11:50	8/12/13	14:20	
88	8/12/13	8:35	8/12/13	8:50	
92	8/12/13	8:35	8/12/13	8:50	
93	8/12/13	8:35	8/12/13	8:50	
96	8/12/13	8:35	8/12/13	8:50	
32	8/13/13	10:35	8/13/13	12:25	

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	Time	Date	Time	
90	8/13/13	8:40	8/13/13	9:40	
94	8/13/13	8:40	8/13/13	9:40	
95	8/13/13	8:40	8/13/13	9:40	
97	8/13/13	8:40	8/13/13	9:40	
98	8/13/13	8:40	8/13/13	9:40	
123					
(DURATHERM)	8/13/13	8:40	8/13/13	9:40	
30	8/14/13	9:47	8/14/13	12:20	
89	8/14/13	10:00	8/14/13	11:20	
91	8/14/13	10:00	8/14/13	11:20	
96	8/15/13	9:20	8/15/13	11:00	
78	8/16/13	12:45	8/16/13	13:30	
88	8/16/13	8:15	8/16/13	9:30	
93	8/16/13	8:15	8/16/13	9:30	
94	8/16/13	8:15	8/16/13	9:30	
95	8/16/13	8:15	8/16/13	9:30	
97	8/16/13	8:15	8/16/13	9:30	
98	8/16/13	8:15	8/16/13	9:30	
89	8/17/13	7:50	8/17/13	10:15	
90	8/17/13	7:50	8/17/13	10:15	
91	8/17/13	7:50	8/17/13	10:15	
92	8/17/13	7:50	8/17/13	10:15	
96	8/17/13	7:50	8/17/13	10:15	
88	8/18/13	7:15	8/18/13	7:45	
93	8/18/13	7:15	8/18/13	7:45	
94	8/18/13	7:15	8/18/13	7:45	
97	8/18/13	7:15	8/18/13	7:45	
98	8/18/13	7:15	8/18/13	7:45	
89	8/20/13	8:30	8/20/13	10:30	
90	8/20/13	8:30	8/20/13	10:30	
91	8/20/13	8:30	8/20/13	10:30	
92	8/20/13	8:30	8/20/13	10:30	
28	8/21/13	11:50	8/21/13	12:30	
88	8/21/13	8:20	8/21/13	11:20	
93	8/21/13	8:20	8/21/13	11:20	
94	8/21/13	8:20	8/21/13	11:20	
98	8/21/13	8:20	8/21/13	11:20	
95	8/22/13	10:55	8/22/13	11:45	
96	8/22/13	10:55	8/22/13	11:45	
97	8/22/13	10:55	8/22/13	11:45	
89	8/23/13	9:30	8/23/13	10:18	
90	8/23/13	9:30	8/23/13	10:18	
91	8/23/13	9:30	8/23/13	10:18	
92	8/23/13	9:30	8/23/13	10:18	
123					
(DURATHERM)	8/23/13	9:30	8/23/13	10:18	
88	8/24/13	7:00	8/24/13	10:15	
93	8/24/13	7:00	8/24/13	10:15	
94	8/24/13	7:00	8/24/13	10:15	
98	8/24/13	7:00	8/24/13	10:15	
95	8/26/13	8:20	8/26/13	10:00	
96	8/26/13	8:20	8/26/13	10:00	
97	8/26/13	8:20	8/26/13	10:00	
89	8/27/13	8:30	8/27/13	11:10	
90	8/27/13	8:30	8/27/13	11:10	
91	8/27/13	8:30	8/27/13	11:10	
92	8/27/13	8:30	8/27/13	11:10	
88	8/28/13	9:40	8/28/13	11:30	
93	8/29/13	9:40	8/29/13	11:30	
94	8/29/13	9:40	8/29/13	11:30	
98	8/29/13	9:40	8/29/13	11:30	
95	8/31/13	7:05	8/31/13	10:15	
96	8/31/13	7:05	8/31/13	10:15	
97	8/31/13	7:05	8/31/13	10:15	
89	9/1/13	7:00	9/1/13	7:30	
90	9/1/13	7:00	9/1/13	7:30	
91	9/1/13	7:00	9/1/13	7:30	
88	9/2/13	6:50	9/2/13	9:30	
94	9/2/13	6:50	9/2/13	9:30	
98	9/2/13	6:50	9/2/13	9:30	
92	9/3/13	9:15	9/3/13	10:30	
19	9/4/13	10:45	9/4/13	13:20	
93	9/4/13	8:24	9/4/13	10:20	
95	9/4/13	8:24	9/4/13	10:20	

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	<i>Date</i>	<i>Time</i>	<i>Date</i>	<i>Time</i>	
96	9/4/13	8:24	9/4/13	10:20	
97	9/4/13	8:24	9/4/13	10:20	
89	9/5/13	10:00	9/5/13	11:00	
90	9/5/13	10:00	9/5/13	11:00	
91	9/5/13	10:00	9/5/13	11:00	
88	9/6/13	8:50	9/6/13	10:00	
94	9/6/13	8:50	9/6/13	10:00	
98	9/6/13	8:50	9/6/13	10:00	
92	9/7/13	7:40	9/7/13	9:45	
123 (DURATHERM)	9/7/13	7:40	9/7/13	9:45	
93	9/8/13	6:45	9/8/13	8:15	
95	9/8/13	6:45	9/8/13	8:15	
96	9/8/13	6:45	9/8/13	8:15	
97	9/8/13	6:45	9/8/13	8:15	
90	9/9/13	8:00	9/9/13	9:30	
91	9/9/13	8:00	9/9/13	9:30	
89	9/10/13	9:35	9/10/13	10:10	
88	9/11/13	8:40	9/11/13	9:45	
94	9/11/13	8:40	9/11/13	9:45	
98	9/11/13	8:40	9/11/13	9:45	
92	9/12/13	8:55	9/12/13	10:30	
93	9/12/13	8:55	9/12/13	10:30	
96	9/12/13	8:55	9/12/13	10:30	
95	9/13/13	9:00	9/13/13	10:15	
97	9/13/13	9:00	9/13/13	10:15	
91	9/14/13	7:10	9/14/13	10:00	
88	9/15/13	7:05	9/15/13	10:15	
89	9/15/13	7:05	9/15/13	10:15	
90	9/15/13	7:05	9/15/13	10:15	
94	9/15/13	7:05	9/15/13	10:15	
98	9/15/13	7:05	9/15/13	10:15	
92	9/16/13	9:30	9/16/13	11:00	
93	9/16/13	9:30	9/16/13	11:00	
95	9/16/13	9:30	9/16/13	11:00	
96	9/16/13	9:30	9/16/13	11:00	
97	9/16/13	9:30	9/16/13	11:00	
91	9/17/13	10:20	9/17/13	10:45	
88	9/18/13	9:17	9/18/13	12:50	
89	9/18/13	9:17	9/18/13	12:50	
90	9/18/13	9:17	9/18/13	12:50	
94	9/18/13	9:17	9/18/13	12:50	
98	9/18/13	9:17	9/18/13	12:50	
92	9/19/13	9:45	9/19/13	10:15	
93	9/19/13	9:45	9/19/13	10:15	
95	9/19/13	9:45	9/19/13	10:15	
96	9/19/13	9:45	9/19/13	10:15	
97	9/19/13	9:45	9/19/13	10:15	
123 (DURATHERM)	9/19/13	9:45	9/19/13	10:15	
91	9/20/13	9:45	9/20/13	10:45	
88	9/25/13	8:19	9/25/13	12:10	
90	9/25/13	8:19	9/25/13	12:10	
94	9/25/13	8:19	9/25/13	12:10	
123 (DURATHERM)	9/25/13	8:19	9/25/13	12:10	
89	9/26/13	8:00	9/26/13	10:20	
92	9/27/13	9:12	9/27/13	10:45	
93	9/27/13	9:12	9/27/13	10:45	
95	9/27/13	9:12	9/27/13	10:45	
96	9/27/13	9:12	9/27/13	10:45	
97	9/27/13	9:12	9/27/13	10:45	
98	9/27/13	9:12	9/27/13	10:45	
91	9/28/13	9:32	9/28/13	10:45	
95	8/19/20	9:30	8/19/20	10:15	
96	8/19/20	9:30	8/19/20	10:15	
123 (DURATHERM)	8/19/20	7:15	8/19/20	7:45	

## **Appendix 8b – 4<sup>th</sup> Quarter 2013 Carbon Canister Report**

Appendix 8b - BWON Single Carbon Canister Breakthrough Monitoring Report  
4TH Quarter 2013

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	Time	Date	Time	
88	10/1/13	7:51	10/1/13	10:00	
94	10/1/13	7:51	10/1/13	10:00	
89	10/3/13	8:00	10/3/13	9:45	
92	10/3/13	8:00	10/3/13	9:45	
95	10/3/13	8:00	10/3/13	9:45	
98	10/3/13	8:00	10/3/13	9:45	
93	10/4/13	7:53	10/4/13	9:00	
96	10/4/13	7:53	10/4/13	9:00	
97	10/4/13	7:53	10/4/13	9:00	
88	10/8/13	7:39	10/8/13	10:15	
90	10/8/13	7:39	10/8/13	10:15	
91	10/8/13	7:39	10/8/13	10:15	
89	10/10/13	7:37	10/10/13	9:25	
94	10/10/13	7:37	10/10/13	9:25	
95	10/10/13	7:37	10/10/13	9:25	
98	10/10/13	7:37	10/10/13	9:25	
92	10/11/13	7:21	10/11/13	10:20	
96	10/11/13	7:21	10/11/13	10:20	
97	10/11/13	7:21	10/11/13	10:20	
93	10/14/13	7:27	10/14/13	9:20	
88	10/15/13	7:27	10/15/13	10:00	
90	10/16/13	7:29	10/16/13	10:00	
91	10/16/13	7:29	10/16/13	10:00	
88	10/17/13	8:36	10/17/13	11:00	
89	10/17/13	8:36	10/17/13	11:00	
92	10/17/13	8:36	10/17/13	11:00	
93	10/17/13	8:36	10/17/13	11:00	
94	10/17/13	8:36	10/17/13	11:00	
95	10/17/13	8:36	10/17/13	11:00	
96	10/17/13	8:36	10/17/13	11:00	
97	10/17/13	8:36	10/17/13	11:00	
98	10/17/13	8:36	10/17/13	11:00	
88	10/18/13	7:21	10/18/13	9:30	
89	10/18/13	7:21	10/18/13	9:30	
90	10/18/13	7:21	10/18/13	9:30	
91	10/18/13	7:21	10/18/13	9:30	
90	10/19/13	7:05	10/19/13	9:20	
91	10/19/13	7:05	10/19/13	9:20	
92	10/19/13	7:05	10/19/13	9:20	
93	10/19/13	7:05	10/19/13	9:20	
94	10/19/13	7:05	10/19/13	9:20	
95	10/19/13	7:05	10/19/13	9:20	
96	10/19/13	7:05	10/19/13	9:20	
97	10/19/13	7:05	10/19/13	9:20	
98	10/19/13	7:05	10/19/13	9:20	
89	10/23/13	7:47	10/23/13	10:00	
88	10/24/13	8:15	10/24/13	10:10	
90	10/24/13	8:15	10/24/13	10:10	
91	10/24/13	8:15	10/24/13	10:10	
93	10/24/13	8:15	10/24/13	10:10	
94	10/24/13	8:15	10/24/13	10:10	
95	10/24/13	8:15	10/24/13	10:10	
96	10/26/13	7:03	10/26/13	8:45	
97	10/27/13	9:52	10/27/13	14:33	
98	10/27/13	9:52	10/27/13	14:33	
89	10/29/13	7:30	10/29/13	10:30	
90	10/29/13	7:30	10/29/13	10:30	
91	10/29/13	7:30	10/29/13	10:30	
94	10/29/13	7:30	10/29/13	10:30	
93	10/30/13	7:30	10/30/13	9:30	
95	10/30/13	7:30	10/30/13	9:30	
88	10/31/13	7:36	10/31/13	10:30	
92	10/31/13	7:36	10/31/13	10:30	
96	11/2/13	7:28	11/2/13	12:00	
97	11/2/13	7:28	11/2/13	12:00	
89	11/4/13	7:39	11/2/13	9:15	
90	11/4/13	7:39	11/2/13	9:15	
91	11/4/13	7:39	11/2/13	9:15	
93	11/4/13	7:39	11/2/13	9:15	
94	11/4/13	7:39	11/2/13	9:15	
95	11/4/13	7:39	11/2/13	9:15	
98	11/4/13	7:39	11/2/13	9:15	
92	11/6/13	7:30	11/6/13	8:30	
88	11/9/13	7:15	11/9/13	8:45	
96	11/9/13	7:15	11/9/13	8:45	
97	11/9/13	7:15	11/9/13	8:45	
89	11/14/13	10:11	11/14/13	13:30	
90	11/14/13	10:11	11/14/13	13:30	
91	11/14/13	10:11	11/14/13	13:30	

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	Time	Date	Time	
93	11/14/13	10:11	11/14/13	13:30	
94	11/14/13	10:11	11/14/13	13:30	
95	11/14/13	10:11	11/14/13	13:30	
98	11/14/13	10:11	11/14/13	13:30	
92	11/16/13	7:37	11/17/13	8:30	
88	11/17/13	7:35	11/17/13	8:30	
92	11/17/13	7:35	11/17/13	8:30	
97	11/17/13	7:35	11/17/13	8:30	
90	11/24/13	7:20	11/24/13	8:45	
89	11/25/13	7:31	11/25/13	9:30	
91	11/25/13	7:31	11/25/13	9:30	
88	11/26/13	7:35	11/26/13	10:00	
94	11/26/13	7:35	11/26/13	10:00	
95	11/26/13	7:35	11/26/13	10:00	
98	11/26/13	7:35	11/26/13	10:00	
96	11/27/13	7:28	11/27/13	8:45	
97	11/30/13	7:20	11/30/13	8:30	
92	12/2/13	8:30	12/2/13	10:15	
90	12/3/13	8:11	12/3/13	9:00	
91	12/3/13	8:11	12/3/13	9:00	
88	12/11/13	8:07	12/11/13	10:30	
89	12/11/13	8:07	12/11/13	10:30	
90	12/11/13	8:07	12/11/13	10:30	
91	12/11/13	8:07	12/11/13	10:30	
92	12/11/13	8:07	12/11/13	10:30	
94	12/11/13	8:07	12/11/13	10:30	
95	12/11/13	8:07	12/11/13	10:30	
96	12/11/13	8:07	12/11/13	10:30	
98	12/11/13	8:07	12/11/13	10:30	
97	12/14/13	7:43	12/14/13	9:00	
88	12/19/13	7:40	12/19/13	9:30	
90	12/20/13	7:40	12/20/13	10:20	
94	12/20/13	7:40	12/20/13	10:20	
89	12/21/13	7:13	12/21/13	9:00	
91	12/21/13	7:13	12/21/13	9:00	
92	12/21/13	7:13	12/21/13	9:00	
95	12/21/13	7:13	12/21/13	9:00	
96	12/21/13	7:13	12/21/13	9:00	
97	12/21/13	7:13	12/21/13	9:00	
98	12/21/13	7:13	12/21/13	9:00	
88	12/23/13	7:41	12/23/13	10:30	
90	12/23/13	7:41	12/23/13	10:30	
94	12/23/13	7:41	12/23/13	10:30	
89	12/25/13	7:30	12/25/13	9:00	
91	12/25/13	7:30	12/25/13	9:00	
92	12/25/13	7:30	12/25/13	9:00	
95	12/25/13	7:30	12/25/13	9:00	
97	12/25/13	7:30	12/25/13	9:00	
98	12/25/13	7:30	12/25/13	9:00	
96	12/26/13	7:57	12/26/13	9:45	
88	12/28/13	7:25	12/28/13	9:10	
90	12/28/13	7:25	12/28/13	9:30	
93	12/28/13	7:25	12/28/13	9:30	
94	12/29/13	7:31	12/29/13	9:35	
89	12/30/13	7:55	12/30/13	9:30	
91	12/30/13	7:55	12/30/13	9:30	
95	12/30/13	7:55	12/30/13	9:30	
96	12/30/13	7:55	12/30/13	9:30	
97	12/30/13	7:55	12/30/13	9:30	
98	12/30/13	7:55	12/30/13	9:30	
88	12/31/13	7:35	12/31/13	12:30	
89	12/31/13	7:35	12/31/13	12:30	
90	12/31/13	7:35	12/31/13	12:30	
92	12/31/13	7:35	12/31/13	12:30	
93	12/31/13	7:35	12/31/13	12:30	
94	12/31/13	7:35	12/31/13	12:30	
95	12/31/13	7:35	12/31/13	12:30	
96	12/31/13	7:35	12/31/13	12:30	
97	12/31/13	7:35	12/31/13	12:30	
98	12/31/13	7:35	12/31/13	12:30	

## **Appendix 8c – 2<sup>nd</sup> Half 2013 Unsafe to Monitor Canister Report**

BWON Semiannual Report  
Appendix 8c Canisters Unsafe to Monitor

Carbon Canister ID	Scheduled Monitoring Date	Remonitored Date
66	7/11/13	7/12/13
69	7/11/13	7/12/13
66	8/1/13	8/3/13
69	8/1/13	8/3/13
72	8/1/13	8/3/13
75	8/1/13	8/3/13
66	8/2/13	8/3/13
69	8/2/13	8/3/13
71	8/2/13	8/3/13
99	9/7/13	9/10/13
99	9/8/13	9/10/13
99	9/9/13	9/10/13
19	9/10/13	9/11/13
71	9/17/13	9/18/13
36	9/22/13	9/23/13
107	9/22/13	9/23/13
108	9/22/13	9/23/13
69	10/26/13	10/27/13
71	10/26/13	10/27/13
114	10/26/13-10/30/13	10/31/13
114	10/26/13-10/30/13	10/31/13
112	10/26/13-10/30/13	10/31/13
114	10/26/13-10/30/13	10/31/13
115	10/26/13-10/30/13	10/31/13
116	10/26/13-10/30/13	10/31/13
117	10/26/13-10/30/13	10/31/13
118	10/26/13-10/30/13	10/31/13
119	10/26/13-10/27/13	10/28/13
120	10/26/13-10/30/13	10/31/13
121	10/26/13-10/30/13	10/31/13
66	11/8/13	11/9/13
69	11/8/13	11/9/13
71	11/8/13	11/9/13
73	11/8/13	11/9/13
74	11/8/13	11/9/13
75	11/8/13	11/9/13
76	11/8/13	11/9/13
114	11/10/13-11/14/13	11/15/13
115	11/10/13-11/14/13	11/15/13
116	11/10/13-11/14/13	11/15/13
117	11/10/13-11/14/13	11/15/13
118	11/10/13-11/14/13	11/15/13
119	11/10/13-11/14/13	11/15/13
120	11/10/13-11/14/13	11/15/13
121	11/10/13-11/14/13	11/15/13
114	11/18/13	11/19/13
115	11/18/13	11/19/13
116	11/18/13	11/19/13
117	11/18/13	11/19/13
118	11/18/13	11/19/13
120	11/18/13	11/19/13
121	11/18/13	11/19/13
112	11/19/13-11/20/13	11/21/13
107	11/22/13	11/23/13
113	11/24/13	11/25/13
114	11/24/13	11/25/13
115	11/24/13	11/25/13
116	11/24/13	11/25/13
117	11/24/13	11/25/13
118	11/24/13	11/25/13
119	11/24/13	11/25/13
120	11/24/13	11/25/13
121	11/24/13	11/25/13
114	12/4/13	12/5/13
115	12/4/13	12/5/13
116	12/4/13	12/5/13
117	12/4/13	12/5/13
118	12/4/13	12/5/13
120	12/4/13	12/5/13
121	12/4/13	12/5/13
114	12/21/13	12/22/13

**Appendix 9a – Benzene Waste NESHAP Laboratory Audit  
Reporting**

**BWON NESHAP LABORATORY AUDIT REPORT**  
**TEST AMERICA – UNIVERSITY PARK, ILLINOIS**

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**Prepared by:**

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**TRINITY CONSULTANTS**

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September 27, 2013

**Project Number: 131401.0129**



# **BWON NESHAP LABORATORY AUDIT REPORT**

**Test America – University Park, Illinois**

## **TABLE OF CONTENTS**

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<b>1. INTRODUCTION .....</b>	<b>2</b>
<b>2. LABORATORY AUDIT METHOD .....</b>	<b>3</b>
<b>3. AUDIT RESULTS .....</b>	<b>5</b>
<b>4. AUDIT FINDINGS .....</b>	<b>8</b>
<b>5. AUDIT RECOMMENDATIONS FOR IMPROVEMENT.....</b>	<b>9</b>
<b>6. ATTACHMENTS.....</b>	<b>10</b>

# **BWON NESHAP LABORATORY AUDIT REPORT**

**Test America – University Park, Illinois**

## **1. INTRODUCTION**

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The BP – Whiting Business Unit (BP) requested that Trinity Consultants (Trinity) perform a Benzene Waste Operations (BWON) NESHAP Laboratory Audit at the Test America facility in University Park, Illinois. Lead Auditor, Steve Freeman of Trinity completed the audit in accordance with Proposal number 131401.0129 on September 17, 2013. During the audit, Trinity reviewed all of the analytical areas and methods of the laboratory associated with BWON NESHAP analysis of samples submitted by BP pursuant to consent decree, section 19.H. Trinity conducted the audit according to the agreed upon scope of work including but not limited to the following:

- Size, cleanliness, and organization of the laboratory;
- Sample bottle preparation areas, sample receiving, storage and log-in procedures;
- Quantity, age, availability, scheduled maintenance and performance of the instrumentation;
- Availability, appropriateness, and utilization of the Quality Assurance Plan (QAP) and Standard Operating Procedures (SOPs);
- Staff qualifications/experience and personnel training programs;
- Results of performance evaluation (PE) samples (as conducted for state or national certification programs);
- Reagents, standards, and sample storage facilities;
- Standards preparation, preparation logbooks, and raw data;
- Bench sheets and analytical logbook maintenance and review; and
- Review of the sample analysis/data package inspections and data management procedures.

This report provides an overview of the BWON NESHAP Laboratory Audit conducted at the Test America, University Park, Illinois facility.

# **BWON NESHAP LABORATORY AUDIT REPORT**

**Test America – University Park, Illinois**

## **2. LABORATORY AUDIT METHOD**

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Prior to the laboratory audit, the Test America management were asked to complete a pre-audit questionnaire provided by BP. Trinity also requested the following documentation for review:

- Laboratory Organization Chart
- Quality Assurance Plan/Manual
- Standard Operating Procedures - listing of the standard operating procedures
- Health & Safety Plan/Chemical Hygiene Plan
- Laboratory Certifications
- Performance Evaluation Studies

Ms. Terese Preston, the Laboratory QA/QC Manager, provided the requested documentation including the completed pre-audit questionnaire. Trinity reviewed all the documentation and prepared an audit agenda for the day. This documentation is provided as attachments to this audit report.

At the start of the on-site audit Trinity conducted an opening meeting with Test America to discuss the audit methodology, the agenda and any logistical considerations necessary to ensure a complete and comprehensive audit. Trinity next toured the facility with Ms. Preston acting as escort. During the audit Trinity met with and interviewed a sampling of the Laboratory Technicians, Supervisors, Laboratory Operations Management, Project Managers and Facility Management. Trinity audited the following laboratory operations:

- Sample container shipping and sample receipt
- Sample handling and storage
- Analytical laboratories with emphasis on volatiles analysis
- Waste disposal storage areas
- Water purification systems
- Quality assurance program and project management
- Data and Report review and preparation
- Data management and storage
- Record retention areas

In addition, the following were audited to determine if the laboratory programs and methods were adequate and effective:

# **BWON NESHAP LABORATORY AUDIT REPORT**

**Test America – University Park, Illinois**

- Personnel including their qualifications, education and training
- Methods of sample container identification, preservation and shipment
- Methods of sample receipt, identification, logging and refrigerated storage
- Lab sample tracking and preparation
- Sample analysis methods including equipment calibration and maintenance
- Test method adherence to standard methods
- Consistency of results by varying technicians and equipment setups
- Management of analytical results and data reporting
- Project management including report writing
- Quality assurance program including multiple reviews of reports
- Internal and external audit programs
- Laboratory certifications to NELAC

# BWON NESHAP LABORATORY AUDIT REPORT

Test America – University Park, Illinois

## 3. AUDIT RESULTS

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**Sample Bottle & Container Area:** The sample bottle & container preparation and shipping area was well organized and clean. All sample containers are new and purchased from an outside vendor. When appropriate, the containers are purchased with the required preservative. All bottles and containers arrive in sealed cartons. Lab coolers are owned by Test America and reused. All coolers are cleaned per procedure and dried prior to shipping to clients. Blank Chain of Custody forms are shipped with the containers and coolers for the clients to fill out and return. Test America maintains the ability to add the needed preservative; however, this is generally not done.

**Sample Receipt Area:** The sample receipt area is well organized and clean. All samples are received during normal business hours which are extended as needed to accommodate clients. All samples are checked for sample identification, temperature, integrity, Chain of Custody, custody seals, preservatives, hold times and logged into the lab LIMS system. All samples go into refrigerated storage immediately after being logged in. Any issues are noted in the LIMS System and discussed with the Project Managers and the client. An external company monitors the temperature of all refrigerators remotely on a 24 hour, 7 day basis and alerts Test America personnel at home if any deviations occur in refrigerator temperatures beyond allowable limits. A monitoring center in the building displays the temperature of all refrigerators at all times.

**Laboratories:** Analysis laboratories were in good condition, neat and organized. Technicians are notified of samples needing analysis through a daily backlog report which also tracks sample identification and hold times. Each sample has its own unique bar code label that matches the barcodes on the backlog report. The Volatiles laboratory is maintained with a positive air pressure to avoid cross contamination from other labs. Personnel access is also limited and controlled. Samples are analyzed using accepted methodologies. GC/MS instrumentation is used for BWON NESHAP analysis using method 8260B. All equipment is calibrated according to established standards. All chemicals used in the analysis are reagent grade and within allowed expiration dates. Water used is purified using a deionizer followed by an ultra-filtration system. Samples are prescreened to determine appropriate dilution levels and rerun if the dilution is not correct. Method blanks and standards are inserted into the analysis sequence to check for any cross contamination or carry over issues. Auto-samplers run the samples in sequence with the run sheets and computer tracking. Samples, standards and surrogates are maintained in refrigerated storage and within hold times and expiration dates. All equipment is well maintained and calibrated at the appropriate frequency. Any deviations, repairs or adjustments due to maintenance are recorded in logbooks and approved by supervisory personnel. Samples are checked for ph

# BWON NESHAP LABORATORY AUDIT REPORT

Test America – University Park, Illinois

after the GC/MS analysis is complete to ensure that sample preservation occurred properly. Any deviations from normal procedure are noted in the records and discussed with the project managers for consultation with the clients.

**Waste Management:** Samples are retained for 30 days prior to disposal. Non-hazardous waste and samples are appropriately disposed. Hazardous waste is identified, handled and stored in a 90 day storage area within the building. The Test America Chicago Laboratory is a Large Quantity Generator of hazardous waste and multiple problems were observed with the storage and disposal methods being used. Test America was aware of the issues and was in the process of taking corrective actions to ensure future storage of hazardous waste and shipments would be handled properly. A shipment of hazardous waste occurred during the audit resulting in many of the issues observed being eliminated before the audit ended.

**Data and Record Management:** All data is managed through the LIMS system. Analytical results are first reviewed by the technician doing the work. A second review occurs by the lab supervision. Records of these reviews are maintained within the LIMS system. After these reviews are completed the data is sent to the Project Manager for the report writing. The Project Manager also completes a final review of the data. The QA/QC Manager completes additional report reviews on a sampling basis. All data on the computer system is stored multiple times daily on the Test America Corporate Headquarters servers in Denver, Colorado. This information is backed up once a day at the Test America facility in Houston, Texas. Hard copy records are being phased out; however, existing hard copy records that are less than 7 years old are still maintained in an isolated storage area within the building. All off-site storage of hard copy records has been eliminated.

**Documentation:** Standard Operating Procedures and Manuals were up to date, available and had current revision numbers.

**Accreditation:** The Test America Chicago Laboratory has multiple Accreditations for multiple purposes. NELAC Accreditations appropriate to the BWON NESHAP Wastewater analysis for Benzene were current for both Indiana and Illinois.

**Health and Safety:** Commitment to health and safety was good. The Chemical Hygiene Plan defines the laboratory program. Observations indicate the health and safety regulations were being followed. Technicians were wearing appropriate safety glasses, lab coats, and using chemical resistant gloves. Eye wash/deluge shower stations and fire extinguishers were easily accessible and being inspected properly. Exits were not blocked and were properly marked. Compressed gas cylinders were secured.

# BWON NESHAP LABORATORY AUDIT REPORT

Test America – University Park, Illinois

**Training:** Personnel were properly qualified, well trained and very knowledgeable. Records of training and evaluations were up to date and complete. Demonstration of Capability certificates were issued and current with one exception.

**Security:** A perimeter security system monitors the building on a 24 hour, 7 day basis with appropriate alerts going to Test America personnel. All exterior doors and windows were being maintained closed and locked from the outside except for the main lobby and the sample receiving door during normal business hours. These two areas have Test America personnel present at all times that the doors are unlocked and there is only locked access beyond the immediate area of these two small receiving rooms.

**Review of prior audit results:** A review was completed of the audit findings and recommendations for improvement from the laboratory audit completed in 2011. The results of this review indicated good progress was made at closing these issues. One of the two prior audit findings from 2011 was closed and one was continued but reduced in level to a recommendation for improvement in this audit. The prior audit also had eight recommendations for improvement. Seven of these were closed and one had observed improvement but remained open during this audit. (See section 5 below.)

**Conclusions:** The laboratory was well run and performing analysis in an effective manner. A few minor issues were observed indicating some improvements are needed. One significant issue was observed and is shown as the one finding for the audit below.

# BWON NESHAP LABORATORY AUDIT REPORT

Test America – University Park, Illinois

## 4. AUDIT FINDINGS

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### Findings:

1. The Test America Chicago Laboratory is a Large Quantity Generator of hazardous waste. Approximately forty-three hazardous waste drums were observed in the 90 day hazardous waste storage area. The following problems were observed relative to hazardous waste procedures for storage and disposal:
  - a. Three drums had lids that were open or not secured;
  - b. Two drums had labels that were unreadable due to their position;
  - c. Five drums were past their due date for disposal;
  - d. Two drums had their Accumulation Start Dates changed such that actual the start date could not be definitively determined from the label.

# **BWON NESHAP LABORATORY AUDIT REPORT**

**Test America – University Park, Illinois**

## **5. AUDIT RECOMMENDATIONS FOR IMPROVEMENT**

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### **Recommendations for Improvement:**

1. Repeat from prior audit: Although improvement was seen from the prior audit it was observed that rinse water bottles were still occasionally kept on top of the MS auto-samplers and purge equipment. It is recommended to place these bottles on the counters to prevent the bottles accidentally falling into the units. This could cause damage to the equipment as well as potentially affecting client samples in the units.
2. Repeat from the prior audit: In 2011 a finding was written regarding the Demonstration of Capability certificates being expired although all training and evaluations had been completed. During this audit all annual training and evaluations of technician performance had occurred on schedule. All technicians' certificates were issued on time with one exception. In the interim, the prior year's Certificate for this one technician had expired. It is recommended to ensure these certificates are always issued on time.

Sincerely,

TRINITY CONSULTANTS

Steve Freeman  
Principal Consultant & EH&S Audit Business Line Manager

# BWON NESHAP LABORATORY AUDIT REPORT

Test America – University Park, Illinois

## 6. ATTACHMENTS

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Attachments:

- a. Audit Checklist
- b. Pre-audit checklist
- c. Corporate Safety Manual
- d. Quality Assurance Manual - Table of Contents
- e. Standard Operating Procedure List
- f. Lab Certifications

**LABORATORY AUDIT  
BENZENE WASTE NESHAP, PURSUANT TO CONSENT  
DECREE, SECTION 19.H.**

**BP**

**PREPARED FOR USEPA**

**LABORATORY AUDIT CHECKLIST**

## Table of Contents

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1.0	General Information .....	2
2.0	Data Management Checklist .....	6
3.0	Effectiveness of QA Program .....	7
4.0	Additional Notes .....	8
5.0	Exit Interview Worksheet .....	9

# BENZENE NESHAP LABORATORY AUDIT CHECKLIST

## 1.0 GENERAL INFORMATION

Item	
Laboratory:	Test America Inc.
Address:	2417 Bond Street, University Park, IL 60484
Phone No.	(708) 534-5200
Date Audited:	September 17, 2013
Auditor(s):	Steve Freeman, Trinity Consultants
Number of Personnel:	92
Certifications:	Illinois (Primary); California; Florida; Kansas; Louisiana; Texas, Indiana (secondary)-NELAC EPA Certificate #100201
Business/Operating Hours:	8:00 am to 5:00 pm Monday thru Friday (limited 2nd & 3 <sup>rd</sup> shift as needed)
Square Footage:	28,000 – 17,000 in labs
Year Founded/Years in Current Location:	1977/36 years total

## 1.1 Organization and Personnel

Item	Yes	No	Comment(s)
Is the organization adequately staffed to meet commitments to BP on a timely manner?	Y		
Is the organization structure sufficient for BP NESHAP work to be performed?	Y		
Is there enough emphasis place on proper health & safety and chemical hygiene practices?	Y		
Do personnel assigned to NESHAP-related work have the appropriate credentials and experience to successfully accomplish the BP's data quality objectives?	Y		
Is training properly documented and records are adequate to attest to personnel expertise at NESHAP analysis?		N	Demonstration of Capability certificate for one technician was expired

## 1.2 General Laboratory Facilities

Item	Yes	No	Comment(s)
Does the laboratory have a security system to protect the premises from intruders and appropriate sign-in/sign-out procedures?	Y		
Are all of the laboratory areas maintained in a clean and organized manner?	Y		
Do all laboratory personnel appear to have adequate workspace?	Y		
Are health and safety and chemical hygiene training and practices adequate and documented throughout the laboratory and are they in accordance with the H&S Plan and CHP?	Y		

Item	Yes	No	Comment(s)
Are the laboratory's practices for waste storage, sample waste, and bottle storage and disposal adequate and in accordance with regulations and laboratory SOPs?		N	Several hazardous waste drums were improperly stored, labelled and not always disposed in a timely manner according to procedures.
Does the laboratory have an adequate supply of and conduct proper monitoring of the deionized water?	Y		Deionized rinse water was well maintained. Rinse water bottles were occasionally kept on top of the MS Auto-samplers.
Are annual ventilation checks and environmental monitoring documented?	Y		
Does the laboratory have sample storage areas of adequate size, that is maintained and monitored to minimize contaminants?	Y		
Are the volatiles laboratories sufficiently ventilated to minimize background contaminants?	Y		

### 1.3 Sample Receipt and Storage Area

Item	Yes	No	Comment(s)
Is there a designated sample custodian? If yes, name of sample custodian. Name: Terese Preston_____	Y		
Are written Standard Operating Procedures (SOPs) available for the receipt and storage of samples?	Y		
Does the SOP adequately cover receipt and storage activities?	Y		
Are custody and sample integrity issues adequately addressed and documented for receipt and storage activities?	Y		
Does the laboratory adequately assess and document sample preservation (temperature and acid preservation)?	Y		
Are the measurement devices adequately calibrated?	Y		
Are cold storage units adequately maintained and monitored for possible contaminants?	Y		
Is the laboratory LIMS adequate to document the location, condition and integrity of samples?	Y		
Are all sample receiving and documentation records adequately maintained?	Y		
Do worksheets/logbooks indicate periodic supervisory review?	Y		

Item	Yes	No	Comment(s)
Are corrective actions (when necessary) clearly documented?	Y		
Are there any evident health and safety issues in the receipt and/or storage areas?	Y		
Is the receipt of rush samples adequately communicated within the laboratory?	Y		
Are all activities and documentation aspects of sample receiving and storage adequate for BP samples?	Y		

#### 1.4 Sampling Vessels/Containers

Item	Yes	No	Comment(s)
Does the laboratory have SOPs for the preparation of sampling vessels/containers?	Y		
If yes above, does the laboratory follow the SOPs?	Y		
Does the laboratory appear to have an adequate supply of sampling vessels/containers?	Y		
Does the laboratory reuse the sampling vessels/containers?		N	Purchased new each time
Does the laboratory lot check the cleanliness of their sampling vessels/containers?	Y		
Does the laboratory ship the sampling vessels/containers under formal Chain-of-Custody and with custody seals?		N	Blank Chain of Custody and Custody Seals provided Yes on request
Does the laboratory provide Trip Blanks?	Y		
Are all vessels/containers, preservatives, reagents, etc. completely traceable?	Y		
Are all sampling vessels/containers properly labeled?	Y		

#### 1.5 Benzene by GC and GC/MS

Item	Yes	No	Comment(s)
Does the laboratory reference the proper methods for the sample analyses?	Y		EPA Method 8260B
Does the laboratory have instrumentation dedicated to volatile analysis in a separate climate- and pressure-controlled room dedicated only to volatile organics analysis?	Y		
Does the instrumentation use voltage control devices and have acceptable maintenance (preventive and service) programs and appropriate documentation (operating manuals, logbooks)?	Y		
Are the volatile samples are appropriately stored in a separate refrigerator and are temperature logs kept that includes all appropriate information?	Y		

Item	Yes	No	Comment(s)
Does the laboratory initiate, analyze, and document results for holding blanks at the appropriate frequency?	Y		
Are volatile standards appropriately prepared, labeled, stored, documented, and traced?	Y		
Are the current/updated SOPs readily available to the analysts?	Y		
Does the laboratory have current MDLs available for all methods and all instruments?	Y		
How and when are aqueous samples pH measurements are taken (if applicable)?	Y		pH checks completed during the GCMS analysis
How do analysts keep track of samples so holding times are not missed?	Y		Backlog reports
Are the frequency, concentration, criteria, and corrective action for the GC/MS tune check appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the initial calibration and calibration checks appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the QC samples and measures (method blanks, MS/MSD, LCS, surrogates, internal standards) appropriate?	Y		
Is the procedure for establishing and updating RT windows acceptable?	Y		
For the GC analyses, are all positive results confirmed on a second dissimilar GC column?	Y		
Does the laboratory perform dilutions if any analyte is over calibration range (if applicable)?	Y		
Does the laboratory quantitate samples from the initial calibration?	Y		
Does the laboratory document manual integrations?	Y		
Does the laboratory monitor for carryover?	Y		
Are magnetic tapes/DAT/CDs stored in a secure place?	Y		
Do supervisory personnel review the data and sign-off on QC results and analyst logbooks?	Y		.

## 2.0 DATA MANAGEMENT CHECKLIST

### 2.1 Sample Tracking

Item	Yes	No	Comment(s)
Is computer hardware consistent with questionnaire?	Y		
Is there an adequate sample tracking system in place?	Y		
Is there a warning system for holding time expirations?	Y		

### 2.2 Data Reporting

Item	Yes	No	Comment(s)
What software is used in report generation?	Y		LIMS. TALS
What types of QC reports are available?	Y		Level 1 thru Level 4 complete document packages
Does the laboratory have a dedicated data package preparation staff?	Y		
How are final reports proofed against input data?	Y		Project Manager
Are data calculations checked?	Y		
Does either the analyst or a QC reviewer check and sign reports?	Y		
How are anomalies/problems noted, tracked and reported?	Y		Noted in LIMS – reported to client

### 2.3 Data Archive

Item	Yes	No	Comment(s)
Describe the system backups, including type, frequency, tape rotation, and tape storage.	Y		Backup on Denver HQ servers multiple times daily and at Houston offsite server daily
Where is data archived and is it under limited access?	Y		Denver HQ and Houston Offsite servers
How long is retained?	Y		5 years storage minimum
How is hardcopy data archived by type and how long is retained for (on-site and off-site?)	Y		5 years – No current hardcopies are kept. Archived hardcopies are kept on-site in an isolated locked room and being eliminated as 5 year mark is obtained.



### 3.0 EFFECTIVENESS OF QA PROGRAM

Item	Yes	No	Comment(s)
Does the laboratory maintain a dedicated QA group? What percentage of the data does the QA group review?	Y		50-60% of analysis.
Does the laboratory participate in external audit programs?	Y		annual
Does the laboratory have a regularly scheduled internal QA program (including internal audits)? If so, how frequently?	Y		
Does the staff have access to a copy of the facility's Quality Assurance Plan (QAP)?	Y		
Are Data Quality Objectives documented in written form?	Y		
Does the QAP address all necessary elements necessary to generate high-quality data?	Y		
Is there a formal staff training program and are training files adequately maintained?	Y		

## 4.0 ADDITIONAL NOTES

[illegible]

## 5.0 EXIT INTERVIEW WORKSHEETS

### 5.1 Evaluation Form

Laboratory Facility: Test America – University Park, Illinois \_\_\_\_\_

Date: September 17, 2013 \_\_\_\_\_ Prepared by: Steve Freeman, Trinity Consultants \_\_\_\_\_

	1	2	3	Comment
<b>1.0 GENERAL INFORMATION</b>				
1.1 – Organization and Personnel		X		
1.2 – General Laboratory Facilities			X	Waste issues were in the process of being corrected during the audit.
1.3 – Sample Receipt and Storage	X			
1.4 – Sampling Vessels/Containers	X			
1.5 – Benzene by GC and GC/MS	X			
<b>2.0 DATA MANAGEMENT CHECKLIST</b>				
2.1 - Sample Tracking	X			
2.2 – Data Reporting	X			
2.3 – Data Archive	X			
<b>3.0 Effectiveness of QA Program</b>	X			

1 – Acceptable, no deficiencies identified

2 – Adequate. Some minor deficiencies were identified that require corrective action

3 - Not Acceptable. Significant major and minor deficiencies were identified. All such items should be discussed with laboratory management and corrective actions agreed upon and noted.

### 5.3 Audit Team Signatures



September 18, 2013

Auditor \_\_\_\_\_ Date \_\_\_\_\_ Auditor \_\_\_\_\_ Date \_\_\_\_\_

Auditor \_\_\_\_\_ Date \_\_\_\_\_

### 5.4 Audit Report Process

A draft audit report is issued to the laboratory for their comment/correction within 2 weeks of the audit (within 48 hours if significant/critical issues are identified). Once finalized, the laboratory has one week to respond and issue a formal corrective action memorandum to the Audit Team Members.

**LABORATORY AUDIT  
BENZENE WASTE NESHAP, PURSUANT TO CONSENT  
DECREE, SECTION 19.H.**

**BP**

**PREPARED FOR USEPA**

**LABORATORY PRE-AUDIT QUESTIONNAIRE**

## Pre-Audit Questionnaire

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1.0	Organization and Personnel.....	2
2.0	Analytical Instrumentation.....	4
3.0	Calibration Materials .....	5
4.0	LIMS .....	6
5.0	Data Reduction/Reporting .....	7
6.0	Laboratory Documentation.....	8

## 1.0 ORGANIZATION AND PERSONNEL

ITEM	
Laboratory Name:	Test America Chicago
Address:	2417 Bond Street, University Park, IL 60484
Phone No.	708-534-5200
Contact Name	Tereese A. Preston
Number of Personnel:	92
Certifications:	IEPA E-LAP: Cert # 100201
Business/Operating Hours:	8 am - 5 pm
Square Footage:	28000 ft <sup>2</sup>
Year Founded/Years in Current Location:	1977; 36 yrs
<b>Laboratory Manager/Director</b> (individual responsible for overall technical effort)	
Name:	Michael J. Healy
Degree(s):	BS Environmental Biology
Years of Direct Experience:	31
<b>GC/MS Volatiles - Laboratory Supervisor</b>	
Name:	Jo Ann Petruszek-Kmetty
Degree(s):	BS Biology
Years of Direct Experience:	22
<b>GC/MS Volatiles (NESHAP) - Analyst</b>	
Name:	Multiple Analysts - see Personnel Skills Matrix Summary
Degree(s):	
Years of Direct Experience:	
<b>GC Volatiles - Laboratory Supervisor</b>	
Name:	Jo Ann Petruszek-Kmetty
Degree(s):	BS Biology
Years of Direct Experience:	22
<b>GC Volatiles (NESHAP) - Analyst</b>	
Name:	William Estes + GRC only
Degree(s):	MS Botany / BS Env. Biology
Years of Direct Experience:	22
<b>QA Officer/Director</b>	
Name:	Tereese A. Preston
Degree(s):	BA Biology
Years of Direct Experience:	29
<b>Laboratory Project Manager</b>	
Name:	Eric Lang
Degree(s):	M.B.A. / BS Biology / Chemistry
Years of Direct Experience:	29
<b>Health &amp; Safety Director</b>	
Name:	Chris Hoham
Degree(s):	MA Chemistry
Years of Direct Experience:	26

## Pre-Audit Questionnaire

ITEM
Item
Will the Quality Assurance Officer be available during the onsite audit? <u>Yes</u> Name: <u>Terese A. Preston</u>
Will the Project Manager be available during the evaluation? <u>No - Secondary PM will be available</u> Name: <u>Therese Hangraves (BS Food Science)</u>
Please attach the most recent laboratory organization chart. If there have been changes, please make to appropriate notations Additional Comments: _____

TestAmerica Chicago  
Laboratory Personnel Experience Summary  
September 16, 2013

Total Employees	Non-Tech Staff	Technical Staff	Section / Title	Degree	Years Laboratory Experience	Project Management	Quality Assurance / Quality Control	Data Management	SW-846 Experience	EPA 600 Method Series Experience
		x	<b>Laboratory Director</b>							
1	1		Michael J. Healy	BS Env. Biology	31	X	X	X	X	X
		x	<b>Quality Assurance/Quality Control</b>							
1	1		Supervisor: Terese A. Preston	BA Biology	29	X	X	X	X	X
1	1		Nadine Jernberg	BS Food Science	30		X			
		x	<b>Section Managers</b>							
1	1		Inorganics: Diane L. Harper	MA Biology	33	X	X	X	X	X
1	1		Organics: Jodi L. Gromala	BS Biology	27	X	X	X	X	X
1	1		Data Management: Paula Buckley	High School	19			X		
		x	<b>Project Managers</b>							
1	1		Eric A. Lang, Customer Service Mgr.	M.B.A. / BS Bio/Chem	29	X	X	X	X	X
1	1		Amanda Grzybowski							
1	1		Therese Hargraves	BS Food Science	17	X	X	X	X	X
1	1		Robin Kintz							
1	1		Bonnie M. Stadelmann	MS Nat. Res. Mgmt.	16	X	X	X	X	X
1	1		Richard C. Wright	MS Env. Science	27	X	X	X	X	X
1	1		Sandie Fredrick, Watertown		10	X				
1	1		Donna L. Ingersoll, Mgr. Decatur Srv. Ctr.	BS Animal Science	25	X	X	X	X	X
1	1		Jim Knapp, Mgr. Chicago Srv.Ctr.	BS Chemistry	25	X	X	X	X	X
1	1		Diana Mockler, IN Srv.Ctr.							
		x	<b>Gas Chromatography/Mass Spectrometry (GC/MS) Analysts</b>							
1	1		Supervisor GC, GC/MS Volatiles: JoAnn Petruszak-Kmetty	BS Biology	22	X	X	X	X	X
1	1		Supervisor GC, GC/MS Semi-volatiles, HPLC: Gary L. Rynkar	BS Env. Biology	25	X	X	X	X	X
1	1		Duran Akcakal	BA Chemistry	20		X	X	X	X
1	1		Elaine Alikpala	BS Chemistry	21		X	X	X	X
1	1		Brett Arndt	BS Chemistry	2		X	X	X	X
1	1		Alfonso Diaz	MS Analytical Chemistry	1					
1	1		David Drabek	AAS Med Tech	20		X	X	X	X
1	1		William R. Estes (GC VOAs)	MS Botany/BS Env Bio	22		X	X	X	X
1	1		Peter Ficarello	BS Biology	9		X	X	X	
1	1		Karen Lesiak	BS Biology	24		X	X	X	X
1	1		Jennifer Hall							
1	1		Wesley Hobart							
1	1		Brent Segally	BS Physics	1					
1	1		William Squires							
1	1		Garth Swaney	BS Chemistry	20		X	X	X	X
1	1		Brian Werner	MS Chemistry	18		X	X	X	X

TestAmerica Chicago  
Laboratory Personnel Experience Summary  
September 16, 2013

Total Employees	Non-Tech Staff	Technical Staff	Section / Title	Degree	Years Laboratory Experience	Project Management	Quality Assurance / Quality Control	Data Management	SW-846 Experience	EPA 600 Method Series Experience
		x	<b>GC Extractables - Analysts</b>							
1	1		Patti Gibson	BS	21		X	X	X	X
1	1		Gene Orf	Ph.D. Analytical Chem	35		X	X	X	X
		x	<b>HPLC / GC Extractables - Analysts</b>							
1	1		Sharon Werner	BS Chemistry	17		X	X	X	X
		x	<b>Organic Extraction Specialists</b>							
1	1		Supervisor: Dan Knieriemen	BA Chemistry (3/4)	23		X	X	X	X
1	1		Deavon Allen	High School	5		X			
1	1		Jessica Dillman	BS Biology	4					
1	1		Lindsey Kras (Part-Time)	BS Env. Sciences	9		X	X	X	X
1	1		Jarvis Price	BS Biology	14		X	X	X	X
1	1		Allison Smiertelny	BS Biology	1					
1	1		Sean Werner	BS Forest Science	7		X			
		x	<b>Wet Chemistry Analysts</b>							
1	1		Supervisor: Carla Bonner	High School	26		X	X	X	X
1	1		Molly Baum	BS Biology	< 1					
1	1		Cheryl Boyd (part-time)	BS Biology	25		X	X	X	X
1	1		Mary Brogan	BS Biology	20		X	X	X	X
1	1		Khona Deb (part-time)	BS Chemistry	20		X	X	X	X
1	1		Jennifer Enge	BS Biology	< 1					
1	1		Colleen Moore	BS Biology	6		X	X	X	X
1	1		Joanna Gazda-Petryszak	BS Natural Sciences	< 1					
1	1		Nicole Rainwater							
1	1		Sean Salmi	BS Environmental Science	< 1					
1	1		Blessing Sokoya	BS Biology	< 1					
1	1		Eliane Treadwell	BS Biology/BA Chemistry	2					
1	1		Heather Wontor	BS Chemistry	2					
1	1		Bridget Yanna							
		x	<b>ICP / ICPMS / CVAA Analysts / Metals Digestion Specialists</b>							
1	1		Supervisor: Debra Johnson	BS Biology	22		X	X	X	X
1	1		Paul Kolarczyk	MS Env. Biology	22		X	X	X	X
1	1		Brandon Bills	BS Chemistry	1					
1	1		David Blake	BS Physics	1					
1	1		Lauren Gillins	BS Chemistry	1					
1	1		Barbara Hamner							
1	1		Lawrence Hudson	BS Biology/Chemistry	3					
1	1		Paul Jones	BS Biology	2					
1	1		Rebecca Laird	BS Biology	1					
1	1		Larry Nelson							
1	1		Michael Peters	BS Biological Sciences	1					

TestAmerica Chicago  
Laboratory Personnel Experience Summary  
September 16, 2013

Total Employees	Non-Tech Staff	Technical Staff	Section / Title	Degree	Years Laboratory Experience	Project Management	Quality Assurance / Quality Control	Data Management	SW-846 Experience	EPA 800 Method Series Experience
		x	<b>Facilities / Health &amp; Safety / Waste Disposal</b>							
1	1		Chris Hoham	MA Chemistry	26					
1	1		Jeremy Newkirk	High School	< 1					
		x	<b>Sample Custodians / Bottle Preparation / Sample Pickup / Laboratory Support Staff</b>							
1	1		Supervisor: Jeff James	BA Music Ed.	24	X				
1	1		Jeff Lunt	High School	16					
1	1		Sherri Scott	High School	26					
1	1		Noe Lopez	High School	4					
1	1		Hector Guzman	High School	6					
1	1		Kris Williamson	High School	1					
		x x	<b>Support Staff</b>							
1	1		Cindy Pritchard	Proposal Coordinator	13					
1	1		Emily Pritchard	Receptionist	1					
1	1		Derrick Jones (part-time)	Bottle Prep	22					
1	1		Jayne Healy	Data Mgmt.	15					
1	1		Jodie Bracken	EDDs	25					
1	1		Kathy Nelson	EDDs	25					
1	1		Syreeta M. Oliver	Glassware / Wet Chem	10					
1	1		James Frost	Glassware	< 1					
1	1		Chris Velduizen	Sample Homogenization/Solids	2					
1	1		Keith Ball	Courier	< 1					
1	1		Dan Evilsizer	Courier	< 1					
1	1		Mike Piotrowski	Courier	17					
1	1		Shawn Kelsey	Courier	14					
1	1		Sergio Cuevas	Courier	< 1					
1	1		Dale Matthies	Bottle Prep	2					
1	1		Ariel Sanchez	Bottle Prep	1					
1	1		Scott Fortin	Maintenance	2					
92	25	67	<b>=Totals</b>			1066	Sum Yrs			
						12	Avg Yrs			

## 2.0 ANALYTICAL INSTRUMENTATION

## 2.1 GC and GC/MS Instrumentation utilized for NESHAP projects\*

Instrument	Manufacturer	Model/ Revision	Installation Date	GC Column(s)	Analyses Performed
GC ID No.	see Attached Instr. Listing				
GC ID No.					
GC MS ID No.					
GC MS ID No.					

\* A complete list of all analytical instrumentation containing the same information as this questionnaire can substitute for completion of this section.

ITEM
Are manufacturer's operating manuals readily available to the operators? <u>Yes, located next to instrument + on CD</u>
Is instrument service and maintenance performed under service contracts? <u>Yes</u>
How is maintenance documented? <u>Maintenance Log; Service Rep Documentation</u>
Please describe your lab's internal preventative maintenance program: <u>UP-PA PAM, Rev. 5 - Table 21-2 lists a schedule of</u> <u>routine maintenance</u>

## TestAmerica Chicago Laboratory Instrument List

Updated: 09/08/13

Equipment/ Instrument	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
GC Extractable INST0304_DRO	HP 6890 GC Plus with Dual FID	6890 (G1530A)	US00001850	2007	NEW
GC Extractable INST1516_PEST	Agilent 6890N GC System with dual ECD	G6890N (G1530N)	S/N CN10411048	2004	NEW
GC Extractable INST1920_DRO	Agilent 7890A GC System with dual FID	7890A (G3440A)	S/N CN10501115	2011	NEW
GC Extractable INST2324_PCB	Agilent 6890N GC System with Dual ECD	G6890N (G1530N)	S/N CN10421024	2004	NEW
GC Extractable INST2526_DRO	Agilent 7890A GC System with dual FID	7890A (G3440A)	S/N CN10371134	2010	NEW
GC Extractable INST2930_WIDRO	Agilent 7890A GC System with dual FID	7890A (G3440A)	S/N CN10848171	2011	NEW
GC Extractable INST3132_PCB	Agilent 6890N GC System with dual ECD	6890N (G1530N)	S/N CN10411047	2004	NEW
GC Extractable INST3738_PEST	HP 6890 Series GC with Dual ECD	6890 (G1530A)	S/N US00004455	1996	NEW
GC Extractable INST4142_HERB	HP 6890 Series GC System: G1530A with Dual ECD	6890 (G1530A)	S/N US00006539	1997	NEW
GC Extractable INST4748_PCB	Agilent 6890A Series GC Plus System: G1530A with Dual ECD	6890A (G1530A)	S/N US00037876	2007	NEW
GC Volatile INST1112_GRO	HP5890A GC with FID	5890A	S/N 2750A17322	1992	NEW
GC Volatile INST1314_GRO	HP5890A GC with FID	5890A	S/N 2750A17321	1988	NEW
GC Volatile INST2122_GRO	Agilent 7890 GC with FID	7890	S/N CN10291030	2010	NEW
HPLC INST4546_PAH	Agilent 1100 HPLC - Detector: Fluorescence Agilent 1100 HPLC - Detector: UV Variable Wavelength	G1321A FLD G1314A VWD	S/N DE23905110 S/N JP24020956	2003	NEW
HPLC INST3940_PAH	Agilent 1100 HPLC - Detector: Variable wavelength	G1314A VWD	S/N JP11414170	2001	NEW
GPC GPC3	J2 Accuprep MPS GPC Injector/Autosampler /Detector APC-UPC	J2M 3300  J2 330	S/N 05C-1143-4.0  S/N DS00005388	2005	NEW
GPC GPC6	J2 Accuprep MPS GPC Injector/Autosampler /Detector	P/N 54022	S/N PUM-S13H-000	2008	NEW

## TestAmerica Chicago Laboratory Instrument List

Updated: 09/08/13

Equipment/ Instrument	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
GC/MS Semivolatile CMS01	Agilent 6890N GC System Agilent 5973 MS Detector	6890N (G1530N) G2578A	S/N US10250131  S/N US21854134	2004	NEW
GC/MS Semivolatile CMS11	Agilent 6890N GC System Agilent 5973 MS Detector	6890N (G1530N) G2578A	S/N CN10308018  S/N US30955129	2003	NEW
GC/MS Semivolatile CMS12	Agilent 6890N GC System Agilent 5973 MS Detector	6890N (G1530N) G2578A	S/N CN10308019  S/N US21854871	2003	NEW
GC/MS Semivolatile CMS20	Agilent 6890N GC System Agilent 5975 MS Detector	6890N (G1530N) G3171A	S/N CN10615045  S/N US861622903	2006	NEW
GC/MS Semivolatile CMS21	Agilent 6890A GC System Agilent 5973 MS Detector	6890A (G1530A) G2577A	S/N US00035156  S/N US10442182	2008	USED
GC/MS Semivolatile CMS23	Agilent 7890A GC System Agilent 5975C MS Detector	7890A (G3440A) 5975C (G3172A)	S/N CN10271149  S/N US10283612	2010	NEW
GC/MS Semivolatile CMS24	Agilent 7890A GC System Agilent 5975C MS Detector	7890A (G3440A) 5975C (G3172A)	S/N CN10211009  S/N US10323620	2011	NEW
GC/MS Volatile CMS02	Agilent 6890N GC System Agilent 5973 MS Detector	6890N (G1530N) G2579A	S/N CN10340024  S/N US33220076	2003	NEW
GC/MS Volatile MS03 (Screener)	HP 5890 Series II GC HP 5972 Series MS Detector	5890 Series II 5972	S/N 3310A47330 S/N 3609A03585	1998	NEW
GC/MS Volatile CMS06	Agilent 6890 Series GC Plus G1530A Agilent 5973 Network MS Detector G2579A	6890 (G1530A) 5973 (G2579A)	S/N US10250132  S/N US21854172	2003	NEW
GC/MS Volatile MS09 (Screener)	HP Series 5890 Series II Plus GC HP 5972 Series MS Detector	5890 Series II 5972	S/N 3336A60300  S/N 3435A01881	1998	NEW
GC/MS Volatile CMS16	Agilent 6890 Series GC Plus G1530A Agilent 5973 Network MS Detector G2579A	6890 (G1530A) 5973 (G2579A)	S/N US00041196  S/N US10360253	2001	NEW
GC/MS Volatile CMS18	Agilent 6890N Series GC Agilent 5975 Series MS Detector	6890N Series (G1530N) 5975 (G3172A)	S/N CN10528010  S/N US51530111	2005	NEW

## TestAmerica Chicago Laboratory Instrument List

Updated: 09/08/13

Equipment/ Instrument	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
GC/MS Volatile CMS19	Agilent 6890N Series GC Agilent 5975 Series MS Detector	6890N Series (G1530N) 5975 (G3172A)	S/N CN10527059  S/N US52430414	2005	NEW
GC/MS Volatile CMS22	Agilent 6890N Series GC Agilent 5973 Series MS Detector	6890N Series (G1530N) 5973 (G2571A)	S/N US10202110  S/N US10442062	2008	USED
GC/MS Volatile CMS25	Agilent 7890A Series GC Agilent 5975C Series MS Detector	7890A Series (G3440A) 5975 (G3712A)	S/N CN10934049  S/N US92033656	2009	USED
Autoanalyzer AQ2	SEAL AQ2 Analyzer	AQ2	S/N 090321	2004	NEW
Autoanalyzer SEAL2	SEAL AQ2 Analyzer	AQ2	S/N 090867	2013	NEW
Autoanalyzer PC Titrate	Burivar - 1/2 Buret Module	PC-1104-00	S/N MS-0E3-585	2004	NEW
Autoanalyzer OI1	OI Analytical (ALPKEM) ER Detector OI Analytical Flow Solution IV	A001614  A002393	131850155  131893155	2013	USED
Discrete Analyzer SYSTEAL	Systea Discrete Analyzer	EasyChem Plus	S/N 0900268	2011	NEW
Ion Chromatography IC-4	Dionex DX-120 Ion Chromatograph	DX-120	S/N 99070500	1999	NEW
Ion Chromatography IC-5	Dionex ICS-1100 Ion Chromatograph	ICS-1100	S/N 12031349	2012	NEW
Ion Chromatography IC-6	Dionex ICS-1100 Ion Chromatograph	ICS-1100	S/N 13040962	2013	NEW
TOC TOC3	Tekmar Dohrmann Phoenix 8000 TOC	8000	S/N 97231001	1997	NEW
TOC TOC4	Tekmar Dohrmann Phoenix 8000 TOC w/Boat	8000	S/N 98239017	1999	NEW
TOC TOC5	Teledyne-Tekmar TOC Analyzer	FUSION	S/N US10216006	2010	NEW
TOX TOX2	Thermo Electron	ECS1200	SN 2005.0179	2005	NEW
PC-BOD BOD1	PC-BOD Automax 122 Sampler	PC-1000-688	261A3N031	2013	NEW
Dissolved Oxygen Meter HACH-DO1	Sension6 Dissolved Oxygen Meter	Sension6	S/N 990400000150	1999	NEW
Dissolved Oxygen Meter HACH-DO2	Sension6 Portable Dissolved Oxygen Meter	Sension6	S/N 040400002840	2002	NEW

## TestAmerica Chicago Laboratory Instrument List

Updated: 09/08/13

Equipment/ Instrument	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Dissolved Oxygen Meter HACH-DO3	HACH HQ40d Portable Dissolved Oxygen Meter	HG40d	None	2012	USED
Flashpoint Tester FP1	Flashpoint Tester - Cleveland Open Cup		S/N 10AY-2	1990	USED
Flashpoint Tester FP4	Flashpoint Tester – Herzog Pensky Marten – Closed Cup	HFP339	S/N 073390090	2007	NEW
pH Meter pH2	pH Meter: Thermo Orion	410	S/N 074127	2003	NEW
pH Meter pH4	pH Meter: Beckman	Φ250	S/N 4188	2007	NEW
pH Meter pH5	pH Meter: Hanna pH/ORP Meter	HI98183	S/N 08241706	2010	NEW
Oil & Grease	Horizon Technology: Oil & Grease Machine – Extractor	SPE-3000XL Plus-SS	S/N 04-2008	2005	NEW
Oil & Grease	Horizon Technology: Oil & Grease Controller	SPE-DEX 1000/3000XL	S/N 09-1131	2009	NEW
Oil & Grease	Speed Vap II – Evaporator	SPEED-VAP 9000	S/N 02-0389	2002	NEW
Oil & Grease	Horizon Technology: Oil & Grease Controller	SPE-DEX 3000XL	S/N 10-1255	2011	NEW
Oil & Grease	Horizon Technology: Oil & Grease Machine – Extractor	SPE-DEX 1000 / 3000XL	S/N 10-1866	2011	NEW
Oil & Grease	Horizon Technology: Oil & Grease Machine – Extractor	SPE-DEX 1000/3000XL	S/N 13-1924	2013	NEW
Oil & Grease	Horizon Technology: Oil & Grease Controller	SPE-DEX 1000/3000XL	S/N 13-1336	2013	NEW
Oil & Grease	Speed Vap III – Evaporator	SPEED-VAP III	S/N 13-0862	2013	NEW
Spectrophotometer SPEC3	Spectrophotometer: Genesys 10vis	10 vis	S/N 2D7D054001	2001	NEW
Spectrophotometer SPEC5	UV mini 1240V Shimadzu	1240V	S/N A10934634610	2009	NEW
Spectrophotometer SPEC6	Spectrophotometer: HACH	DR2700	S/N 1383442	2011	NEW
Spectrophotometer SPEC7	UV mini 1240V Shimadzu	1240V	S/N A10955001542	2013	NEW
Conductivity Meter	Specific Conductivity Meter: VWR EC Meter	1056	S/N 0104022	2001	NEW
Turbidimeter TURB2	Turbidimeter : VWR Scientific	66120-200	S/N TUB800-2393	2011	NEW
Mercury CV Analyzer HG5	Teledyne Leeman Auto Mercury Analyzer	HYDRA AA	S/N 7014	2008	USED
Mercury CV Analyzer HG6	Teledyne Leeman Hydra II Auto Mercury Analyzer	HYDRA II	S/N 0023	2010	NEW

## TestAmerica Chicago Laboratory Instrument List

Updated: 09/08/13

Equipment/ Instrument	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
ICP ICP5	TJA ICAP 61E Trace	13559500	S/N 10792	2001	NEW
ICP ICP6	Thermo Fisher ICAP 6500 DUO	6500 DUO	S/N 20083806	2008	NEW
ICP-MS ICPMS2	ThermoElectron Corp ICP-MS X-Series II ID100 Autodiluter ESI FAST Autosampler SC4-DX	X-Series II  ID100 SC4-DX	S/N 01189C  S/N 00293 S/N X4DX-HS-TSP- 16-091013	2007	NEW
ICP-MS ICPMS3	ThermoElemental ICP-MS X-Series CETAC Autosampler ASX-520	X7-Series  ASX-520	S/N 0195  S/N 101209A520	2013	USED
TCLP-4 Extraction Apparatus	TCLP Millipore Rotary (4 place extractor)	115V	S/N 455R44033	1991	NEW
TCLP-48 Extraction Apparatus	TCLP Rotation System: Associated Designer & Manufacturer	3740-48BRE	S/N 2244	2010	NEW
TCLP-12 Extraction Apparatus	TCLP Rotation System: Environmental Express LE Rotator	GF18N060- BMYJ1C	8212 12 631	2012	NEW
TCLP-12 Extraction Apparatus	TCLP Rotation System: Environmental Express LE Rotator	GF18N060- BMYJ1C	8212 12 632	2012	NEW

## 3.0 CALIBRATION MATERIALS

Test	Source of Standard(s)*	Source of Reference Samples**
Benzene	see lab SOP - UP-MV-8260	
Benzene		

\*Standard materials used to prepare calibration standards.

\*\*Reference samples (viz., second source) supplied to verify external accuracy.

ITEM
How long are intermediate and working benzene NESHAP standards held for (as the default)? Refer to individual lab SOP UP-MV-8260
Are all benzene NESHAP standards and spike solutions completely traceable from labeling, preparation logbooks and Certificates of Analysis and available for inspection? Yes
Please describe how your laboratory assures that expired reference materials are not used and how often refrigerators/freezers are cleaned out and expired materials removed: LIMS system reagents module does not allow the use of an expired standard. Refrigerators/freezers are evaluated on a monthly basis for expired stocks.

#### 4.0 LABORATORY INFORMATION MANAGEMENT SYSTEMS (LIMS)

ITEM
Provide a brief overview of the LIMS (Make/Platform, etc.) <i>refer to document: Tals-Lims-Chicago.doc</i>
Are GCs and GC/MSs to be used for benzene NESHAP work directly linked to LIMS? <i>Yes</i>
Provide a complete list of functions that the LIMS provides: <i>import results directly from Chrom Data System; calculates final results &amp; reports data to client depending on client deliverable requirements,</i>

## Chicago LIMS Laboratory Information Management System (LIMS)

A key element of the laboratory's operations is the Laboratory Information Management System (LIMS). LIMS is used to record, document, and assimilate pertinent laboratory technical and administrative data. LIMS provides data management functions for a number of component laboratory activities including:

- Sample container orders
- Laboratory sample acceptance
- Recording analytical results
- Tracking sample status
- Scheduling
- Recording QA/QC results
- Final report generation and invoicing
- Preparation of electronic data packages
- Management reports

### **Computer Hardware Summary**

- The primary LIMS system hardware is a Microsoft SQL Server database working in conjunction with two Applications Servers housed in each facility. The primary user application is Microsoft .NET based and resides on each user PC. Microsoft SQL Server replication is utilized to synchronize standard information between all locations operating this LIMS.
- The environmental conditions of the facility housing the LIMS are controlled to protect against data loss. Access to the central computer facility is restricted by keyed entry used by IT staff. The central computer room is temperature controlled, and has an Uninterrupted Power Supply (UPS) to ensure that the WAN functions are not disrupted by power failures.
- Electronic data files are continually archived to protect against catastrophic data/system loss due to equipment failure and for long-term data storage. Data backup files, which include all methods, instrument data, processed data, and forms, are performed daily, and system backups monthly, for each data production system. Backups are stored on tape cartridges and secured in a fireproof unit. LIMS reports and associated QC data are maintained on the LIMS hard diskettes and/or magnetic tape. All data on the LIMS is backed up on a daily basis on magnetic media.
- Records for installation of the network hardware are maintained by the central System Administrator. This system is administered and maintained by corporate staff.
- The local systems consist of computer equipment for analytical instruments, data evaluation, and upload to the LIMS. A local-area network (LAN) supports the local office software.

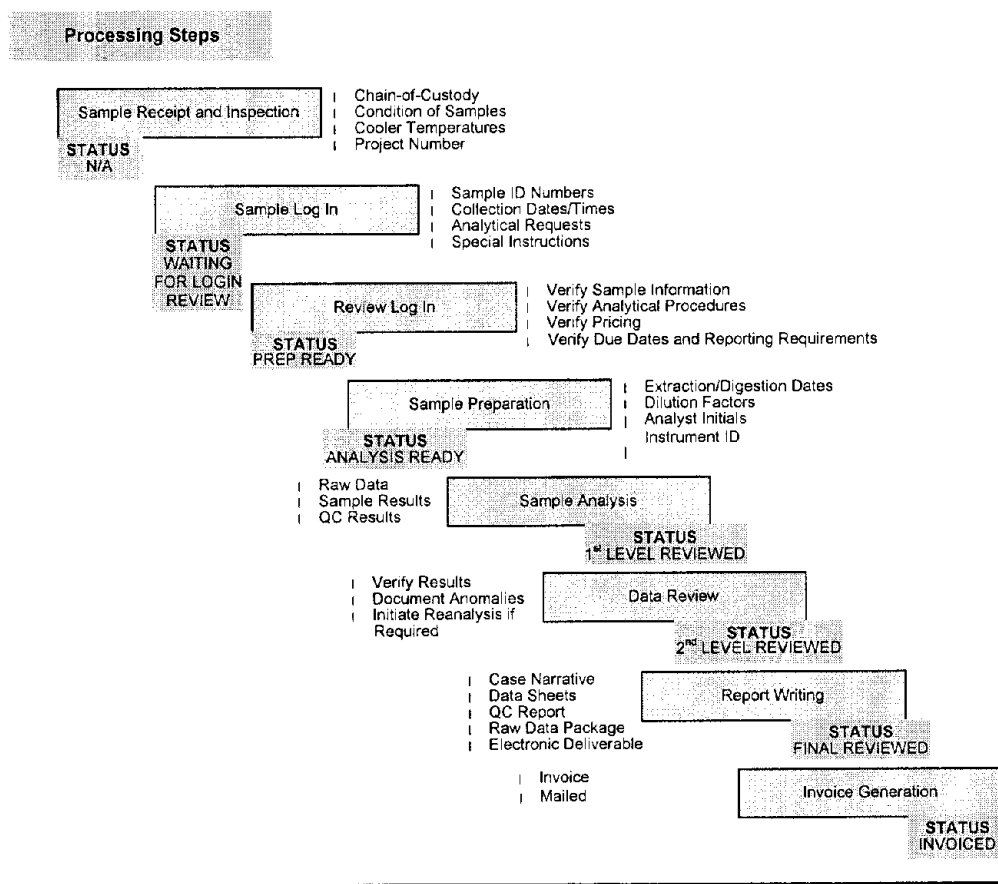
### **Software**

Data processing within the laboratory is performed on a Local Area Network (LAN) employing TCP/IP networking protocol. The organic segment of the LAN is comprised of a network server utilizing Windows NT 4.0 operating system. User specific login sequences that tailor secured data access to the specific user's needs provide system security. TurboChrom software in GC and HP ChemStation software in GC/MS are used for data acquisition. Target NT 4.14 and the LIMS Analyst Desktop interface software is used to process the organic data and generate forms for data packages. GALP protocols are built into the software providing a complete audit trail of data within the laboratory. Reportable results are transferred to the LIMS via the LAN/LIMS interface.

Metals data are managed using specific instrument software applicable to the type of instrument and the LIMS Analyst Desktop interface for data review and forms generation. General Chemistry methods are processed using the LIMS Analyst Desktop interface for data calculations, review, and forms reporting. These programs eliminate manual data entry errors and improve the timeliness of data reporting. Many instruments are interfaced with LIMS to provide for upload of sample results, minimizing the time and error associated with manual data entry. The data management system enhances coordination among all laboratory activities and other TestAmerica-STL laboratories by providing a highly automated communication network for data transfer and correlation.

As sample preparation and analysis information is entered into LIMS, the system automatically updates the status of the affected test requests (see Figure 1, LIMS Information Flow Maximizes Accuracy). As the status of all requests for a given sample reaches certain points, the status of the sample is updated to indicate the extent to which the data is complete. The status of the project is then updated as the associated samples approach completion. When all required tests for all samples in a project have been completed, reviewed, and released for reporting, the final report is printed.

**Figure 1. LIMS Information Flow Maximizes Accuracy**



## 5.0 DATA REDUCTION/REPORTING

ITEM
What software packages are used in data processing, reduction and reporting?
Chrom Data Acquisition Software
TALS - TestAmerica LIMS Data System
Does the lab have versatile capabilities to generate EDDs? List the formats available
Yes - refer to Lab SOP : UP-15-ED- Electronic Data
Deliverable Specification, Development, Generation
and Review

**6.0 LABORATORY DOCUMENTATION**

**6.1 Quality Assurance Plan/Manual**

Please provide a copy of the Table of Contents for the laboratory's QA Plan/Manual.

**6.2 Standard Operating Procedures**

Please provide a complete indexed listing of the laboratory's standard operating procedures (include revision numbers and effective dates).

**6.3 Health & Safety Plan/Chemical Hygiene Plan**

Please provide a copy of the Table of Contents for the laboratory's Health & Safety Plan and Chemical Hygiene Plan.

**6.4 Laboratory Certifications**

Please provide a complete list the laboratory certifications.


**6.5 Performance Evaluation Studies**

Please provide a complete copy of the results of laboratory's most recent USEPA performance evaluation studies and any other pertinent performance evaluation studies available for review during the on-site inspection.

**TITLE: FACILITY MANAGEMENT:  
Environmental Health and Safety Manual Addendum**

**Approvals (Signature/Date):**

 4/15/13  
Mark Storm  
Env. Health & Safety Coordinator

  
Michael J. Healy  
Laboratory Director

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## **1.0 SCOPE / APPLICATION**

This SOP is an addendum to the Environmental Health and Safety Manual for the TestAmerica Chicago facility.

### **1.1 Procedures for responding to emergencies:**

#### **1.1.1 Emergency Coordinators:**

Primary –Mark A. Storm–EHSC		
1609 East County Highway 35	cell	1-708-546-6200
Watseka, IL 60970		
Secondary- Jeff James		
3146 178 <sup>th</sup> Place	cell	1-708-204-9777
Lansing, IL 60438		

#### **1.1.2 Emergency Contacts:**

University Park Police Department		9-911
University Park Fire Department		9-911
Riverside Corporate Health (Kankakee)		1 - 815-935-7532
St James Occupational Health Olympia Fields Campus		1 - 708-503-3222
South Suburban Hospital (Trauma II)		1 - 708-799-8000
Poison Control Center		1 - 800-942-5969
Commonwealth Edison (electric)		1 - 800-334-7661
Northern Illinois Gas		1 - 888-642-6748
Aqua Illinois Water		1 - 800-851-1305
INFOTRAC 24 Hour Response		1 - 800-535-5053
Illinois State Police		1 - 815-726-6291
Illinois EPA		1 - 217-782-6761
Illinois Office of Emergency Response		1 - 217-782-7860
Will County LEPC		1 - 815-740-0911
SET Environmental (emergency response)		1 - 847-537-9221
Mike Healy – Facility Director	Cell	1 - 708-243-0768
Ray Frederici – EHS Officer	Fwd to Cell	1 - 877-785-7233
Kene Kasperek EHS Group Leader		1 - 716-691-2600

## **1.2 Facility Contingency Plans**

- Evacuation routes are posted throughout facility. A map of facility is located in Attachment 3.
- Designated assembly area is the field across Bond Street at the northwest end of the facility (across from the Reception area.)
- Alarms - loud continuous horn (audible); strobe light alarm (visual)
- Maps to nearest hospitals are available in Attachment 5 and in the safety office.
- Directions on how to manage situations requiring non life threatening medical treatment are located in Attachment 5.
- Pre-Arrangements have been made with local hospitals (RIMS (Bradley), St James Occupational Health Olympia Fields Campus, Advocate South Suburban Hospital), University Park Police Dept., University Park Fire Dept., Will County Local Emergency Planning Committee.
- For all emergencies, the procedures outlined in the EHSM are to be followed. The EHSM is available on TestAmerica Intranet site and hard copies are located in the EHSC office.
- Our contracted emergency response organization is SET Environmental, Inc. Technical Services Division, 450 Sumac Rd, Wheeling, IL 60090. Phone number is 847-537-9221.

**1.2.1 Emergency equipment available:**

- ◆ Solvent, acid/base, aqueous spill clean up materials
  - Spill carts ---South area 1, central area 2
    - Spill socks 3" x 4' (use for liquids, not conc. acids)
    - 3" x 10' (use for liquids, not conc. acids)
    - Absorbent mats (use for liquids, not conc. acids)
    - Absorbent pillows (use for liquids, not conc. acids)
    - Disposal bags (use for liquids, not acetone, acetonitrile, or DCM)
    - Emergency Response guide book
    - Putty sticks (for leaking barrels)
  - Laboratory spill kits ---throughout building
    - Spill socks 3" x 4' (use for liquids, not conc. acids)
    - Absorbent mats (use for liquids, not conc. acids)
    - Disposal bags (use for liquids, not acetone, acetonitrile, or DCM)
  - Bulk absorbents ---Waste area
    - Vermiculite/granulated clay (for all liquids)
- ◆ Elemental mercury (Hg) spill clean up material
  - Mercury Spill kit ---waste area, PCB lab
    - Mercury sponge
    - Mercury amalgamate
    - Mercury indicator
    - Disposal bags
- ◆ Fire Suppression Equipment
  - ABC dry chemical extinguishers ---throughout building
  - CO2 extinguishers ---throughout building
  - Water extinguishers ---old data storage, EHSC office
- ◆ Reference material ---EHSC office via TestAmerica's intranet site located at the following address: <http://intranet.testamericainc.com/>
  - 29CFR (OSHA)
  - 40CFR (EPA)
  - 49CFR (DOT)
  - Sax's Dangerous Properties of Industrial Materials
  - Merck Index
  - Emergency Response Guidebook
  - MSDS files located on Intranet Site
  - <http://hq.msdsonline.com/testamerica/Search/ListProducts.aspx>
- ◆ Misc. equipment
  - Writing board w/ erasable pen ---area 1 south spill kit
  - Spill check list ---in each spill kit
  - Emergency contact phone list ---posted in each group area
  - Flashlight ---EHSC office, spill carts
  - First aid kits ---throughout facility, larger and portable kits in first aid room
  - Walkie talkies ---Reception Area, safety office, and Main employee entrance in rear of building

**1.2.2 Emergencies:**

Possible emergencies at TestAmerica Chicago include: medical injury, fire, large and small spills of hazardous material, security breach, power outages, tornado, explosion, and severe thunderstorms.

### **1.3 Personal Protective Equipment (PPE):**

- All employees shall adhere to the standards outlined in the EHSM.
- No respirators are worn at TestAmerica-Chicago or in field activities. Air monitoring has shown them unnecessary at this facility. No respirator program is in place.
- Hearing protection is necessary in the Waste Area when the plastic shredder is running.

### **1.4 Procedures for Regulatory Agency Representative visit:**

Follow the guidelines outlined in the EHSM.

- Agency personnel should be seated in the conference room off the Reception area until Lab Director and/or EHSC can greet them.

### **1.5 Location of MSDS files and other safety documents:**

MSDS' are located on the company intranet site then click on the icon labeled MSDS online. MSDS's are available 24 hrs a day. In the event of a computer malfunction or loss of MSDS Online, the file cabinet in the EHSC office contains copies of MSDS's used at TestAmerica Chicago.

### **1.6 Procedures for Working Alone:**

The Lab has three different work classifications for safety risk; Low, Medium and High Level. Each level has a different policy for working alone.

- 1.6.1 Low Level** work is classified as Office work, or work in a lab type area which is limited to computer or GC work only.
- ✓ Low Level working alone is allowed after normal business hours. However, all employees will be required to approve with supervisors prior to doing so. If an employee will be working for more than two hours a check-in to a supervisor must also be conducted. When the employee leaves the building the employee will notify his or her supervisor.
- 1.6.2 Medium Level** work is classified as mainly lab work which may include work with stable chemicals, reagents etc. of a limited quantity, such as Log-In, Bottle Project and Wet Chem. Medium Level work requires that at least one other person be present in the building.
- 1.6.3 High Level** work is classified as any job which may at any point include the employee in a hazardous situation or working with chemicals of a dangerous nature or high quantity.
- ✓ High Level working alone is permitted **ONLY** when an established communication has been made with one other employee in the building using company supplied two-way radios.

### **1.7 Driver Check-In Policy:**

Sample pick-up and Field crew personnel are required to inform the Log-In manager/personnel of the arrival to and returning from each site visited.

### **1.8 Transition and exclusion areas:**

Exclusion areas include:

- a. The Log-in dock requires that employees handling sample containers are required to wear safety glasses, lab coat and gloves.
- b. Bottle Project employees are required to wear safety glasses, lab coat and gloves when preservative vials are being handled.

Transition areas include: Field loading dock, hallways through out laboratory.

### **1.9 Lockout/Tagout:**

All LOTO equipment will be serviced by outside vendors.

- Any Equipment that is capable of being locked-out will be locked-out. Examples of such equipment include plastic shredder, water evaporator, all electrical panels, and all lab instruments. See attached for a list of LOTO serviceable equipment.

### **1.10 Transportation of DOT Hazardous Materials / DOT Security Plan:**

- All employees who prepare or ship DOT Hazardous Materials must be trained according to DOT regulations and have current training documents.
- Access to the Hazardous Waste Storage facility shall be restricted to authorized personnel only. The doors to the HWSF shall remain locked unless adding or removing waste by a qualified employee.
- Hazardous material storage areas will be inspected once each week in accordance with Federal and State regulations.
- The only approved hazardous materials transporter authorized by TestAmerica Chicago is Clean Harbors Environmental Services, INC.
- All Hazardous Materials stored by TestAmerica Chicago will be kept in a manner that prevents access by unauthorized personnel.
- Emergency Response for all shipped DOT Hazardous Materials shall be handled by Infotrac at 1-800-535-5053

***\*No employee shall ship a hazardous material without the express permission of the EHSC.***

### **1.11 Designated areas for Handling Carcinogens**

- All standards or samples that have known compounds listed on the **TestAmerica Carcinogen List** located in the TestAmerica Corporate Safety Manual Appendix XII must be handled with extreme caution under a functioning fume hood.

### **1.12 Misc.:**

Field employees will not enter confined spaces.

- The two ladders, 6' Louisville and 10' Louisville will be inspected and noted in monthly inspection log.

### **1.13**      **Qualified Trainers:**

The following employees are qualified to train TestAmerica Chicago employees on the following topics.

- a. Diane Harper has an M.A. in Biology/Physiology and a B.S. in Biology. She has many years of laboratory experience serving as a section manager to the Wet Chemistry lab for 25 years. She is qualified to train in the following topics: Glassware Safety, Chemical Compatibility and HAZCOM.
- b. Mark A. Storm has a B.S. in Environmental Science with an EHS minor, and has many years of experience working in a Laboratory setting.

### **2.0**      **Attachments**

- |               |   |
|---------------|---|
| Attachment 1: | Lock Out Tag Out List   |
| Attachment 2: | Document Matrix   |
| Attachment 3: | Facility Maps: PPE; Floor Plan                                      |
| Attachment 4: | Facility Maps: Evacuation routes, and Emergency Equipment Locations |
| Attachment 5: | Emergency First Aid Response Hand out                               |

### **3.0**      **REVISION HISTORY**

- Revision 06 updated on 04/15/13
- All references to Jessica Roach were replaced with Mark Storm
- All references to Jack Tuschal were replaced with Ray Frederici

**Attachment 1:****Lock Out Tag Out List**

<b>Item</b>	<b>Location</b>	<b>Panel Location</b>
1.) Autoclave	HWSF hallway	Field Dock closet
2.) Plastic Grinder	HWSF	HWSF hallway
3.) Floor Furnace	Field Dock	Field Dock
4.) Furnatrol Oven	Extractions Dish room	Local
5.) Water Heater	Receiving Dock	Local
6.) Rock Grinder	Solids Prep	Local
7.) Wall unit A/C	Wet Chem	Local
8.) HPLC Drying oven	Wet Chem	Local
9.) Liebert A/C unit	PCB	Local
10.) Wall A/C unit	GC	Local
11.) R.O. Water treatment	Cylinder Hall	Local

**Attachment 2:**

**Document Matrix**

<b>Document</b>	<b>File</b>
<b>OSHA/Safety</b>	<b>1</b>
Any printed copies of the CSM and the facility addendum to the CSM.	1
Area Safety Analysis forms for work areas.	1
Contractor Communication forms	1
Method Development forms for new methods being developed.	1
Standard Operating Procedures	1
Incident Data <ul style="list-style-type: none"> <li>Incident reports</li> <li>Supporting documentation collected during the incident investigation</li> <li>Any doctor's report relating to the incident</li> <li>Any other monitoring data collected as a result of the incident</li> <li>Documentation which demonstrates that corrective actions were carried out</li> </ul>	1 *See note
Training Documentation listed below. Every employee must have a training file that contains all training that is given to the employee. A training matrix should be prepared for all employees showing what training they must complete.	1
Orientation training forms	1
Orientation training follow up exams	1
Documentation demonstrating that monthly training was carried out each month.	1
Documentation showing that mandatory topics listed in section 4.7 has been covered. Mandatory topics include <ul style="list-style-type: none"> <li>The annual review of key elements of the CSM not covered during other training sessions and changes to the CSM</li> <li>A review of the hazard communication or laboratory standard as appropriate</li> <li>Emergency procedures to be followed</li> <li>Procedures for use of fire extinguishers</li> <li>Procedures for use and storage of hazardous materials</li> <li>PPE requirements</li> <li>Procedures for handling glassware</li> <li>Procedures for lifting and moving materials</li> <li>Ergonomics in the work place including proper procedures for use of computer equipment</li> <li>Procedures for Managing waste at Satellite Accumulation Areas</li> </ul> Documentation that must be covered includes <ul style="list-style-type: none"> <li>Supporting documentation used to conduct the training</li> <li>Sign in rosters</li> <li>Training tests</li> <li>The annual ergonomics evaluation form</li> </ul>	3
Documentation showing that training on specialized topics has been covered as required. Specialized training topics may include but are not limited to the following. <ul style="list-style-type: none"> <li>Incident investigation training</li> <li>Area Safety Analysis training</li> <li>Hazwoper/Emergency Responder training</li> <li>Training for emergency response teams</li> <li>Training for individuals who are authorized to process and ship hazardous waste</li> <li>Training for individuals who are authorized to ship dangerous goods under the DOT regulations</li> <li>30-hour OSHA certifications</li> <li>First aid/CPR</li> <li>LOTO training</li> <li>Blood Borne Pathogen</li> <li>Electrical Safety</li> <li>Defensive Driving</li> </ul>	3

Document	File
Inspections records. This includes but is not limited to the following. <ul style="list-style-type: none"> <li>Quarterly inspections conducted by the EHSC or a team headed by the EHSC. If the inspections are conducted more frequently they must also be kept.</li> <li>Inspection forms prepared by the management team when they visit operations</li> <li>Regulatory inspections</li> </ul>	1
Safety committee minutes	1
Monitoring results including the following. <ul style="list-style-type: none"> <li>Air Monitoring results</li> <li>Wipe tests of work surfaces for non radioactive materials</li> <li>Wipe tests for potential contamination of surfaces by radioactive materials. This includes ECD test records</li> <li>Noise measurements</li> <li>Medical monitoring data conducted in relation to employee exposures or regulatory standards.</li> </ul>	1 6 1
Data used to calculate air emissions	1
Fume hood test records	1
A list of specialized PPE that is used on work sites	1
Emergency equipment test records including the following. <ul style="list-style-type: none"> <li>Fire alarms and alarm systems</li> <li>Fire extinguishers</li> <li>Eyewashes</li> <li>Showers</li> <li>Ground Fault Interrupt Circuits</li> <li>First aid kits</li> <li>Spill kits</li> </ul>	1
Emergency drill records	1
<b>Environmental Compliance Records</b>	1
Air emission records	1
Waste training records	3
EPA waste generator numbers	1
Waste manifests	5
Land Disposal Restriction Notifications	5
Certificates of destruction for waste sent off site for disposal	5
Tracking logs for waste shipped off site or treated on site	5
Inspection records for the main waste accumulation areas	1
Biennial or other reports required by state authorities	1
Procedures for processing waste	7
Waste minimization plans	7
<b>DOT Compliance</b>	3
Training records for employees who are authorized to package and ship dangerous materials.	1
DOT security plans	1
Shipping records for dangerous goods	1
Procedures for preparing and shipping sample kits under the exempt small quantity rule	8
Test results showing coolers that are packed comply with exempt small quantity rules	1
Wipe test results including ECD tests	6
<b>Other Potential Records</b>	1
Internal audit reports and related documents.	1
External audits	1
Records for visits from outside regulatory agencies including any reports, citations and fines.	1

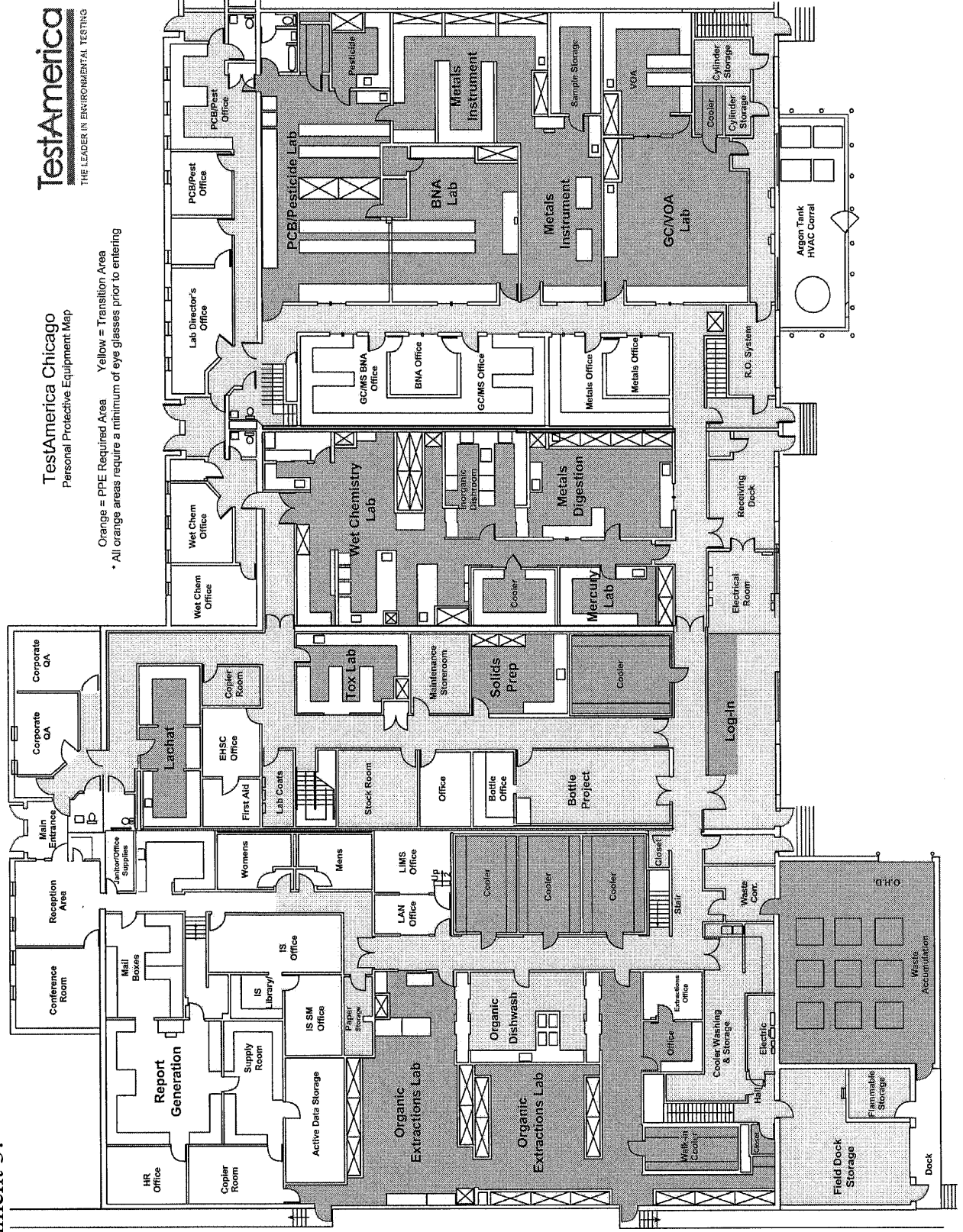
**\*In the event of a regulatory visit the following documents can be found in one of the following locations:**

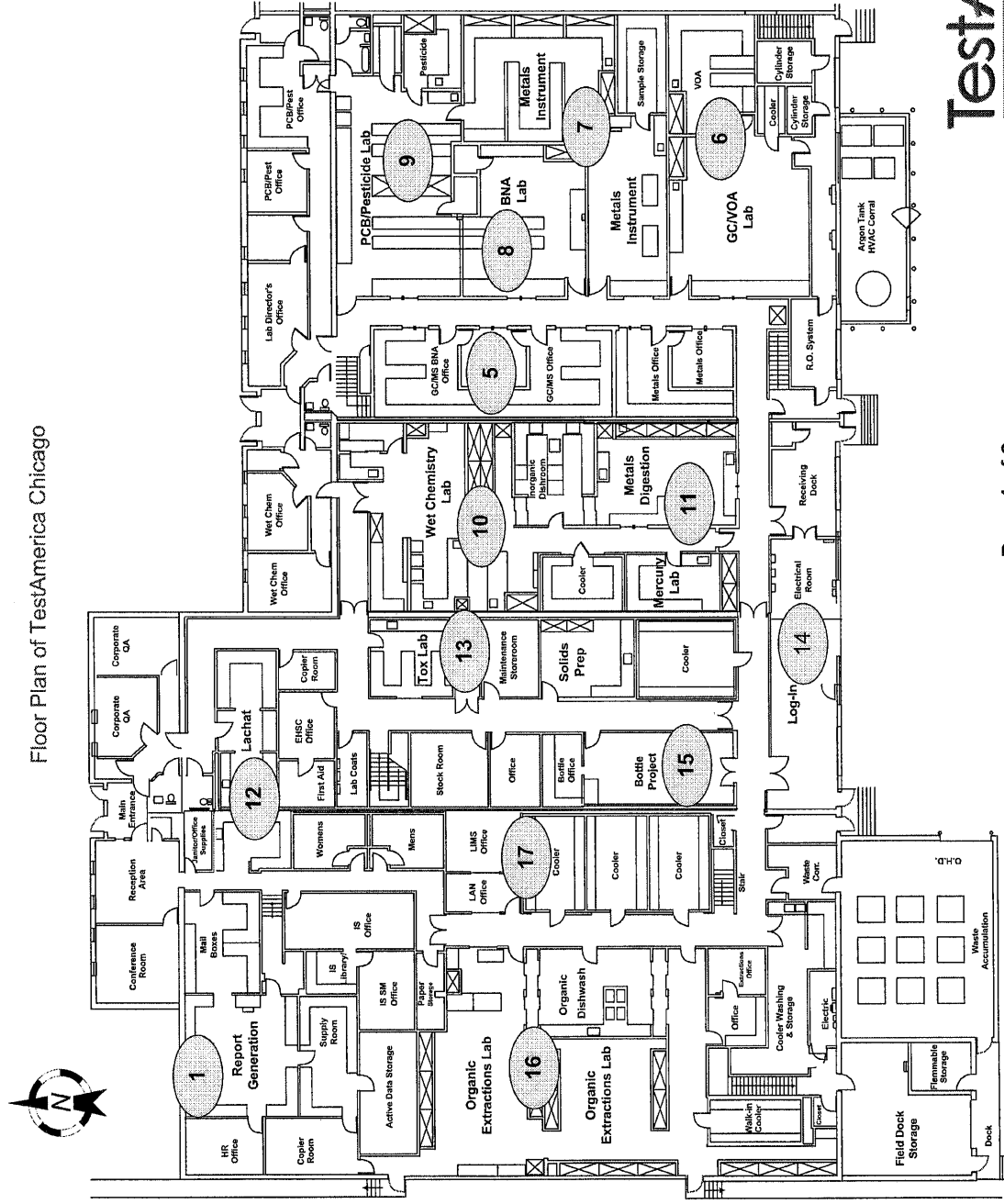
- 1.) Safety Documents (located in the EHSC office) \* Note confidential personnel documents are located with Paula Buckley in Report Generation
- 2.) Facility Documents (located in the EHSC office)
- 3.) Active Employee Files (located in the 1<sup>st</sup> Aid room in back of EHSC office on right side)
- 4.) Inactive Employee Files (located in the 1<sup>st</sup> Aid room in back of EHSC office on right side)
- 5.) Waste Manifests (located in the EHSC office and in the 1<sup>st</sup> Aid room in back EHSC office on right side)
- 6.) Located in EHSC office on bookcase
- 7.) Located in Hazardous Waste Storage Facility Office on desk in space 1-124
- 8.) Located in Bottle Project posted on East wall in space 2-145

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Orange = PPE Required Area      Yellow = Transition Area

\* All orange areas require a minimum of eye glasses prior to entering



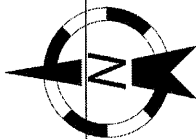


## Key Areas\*

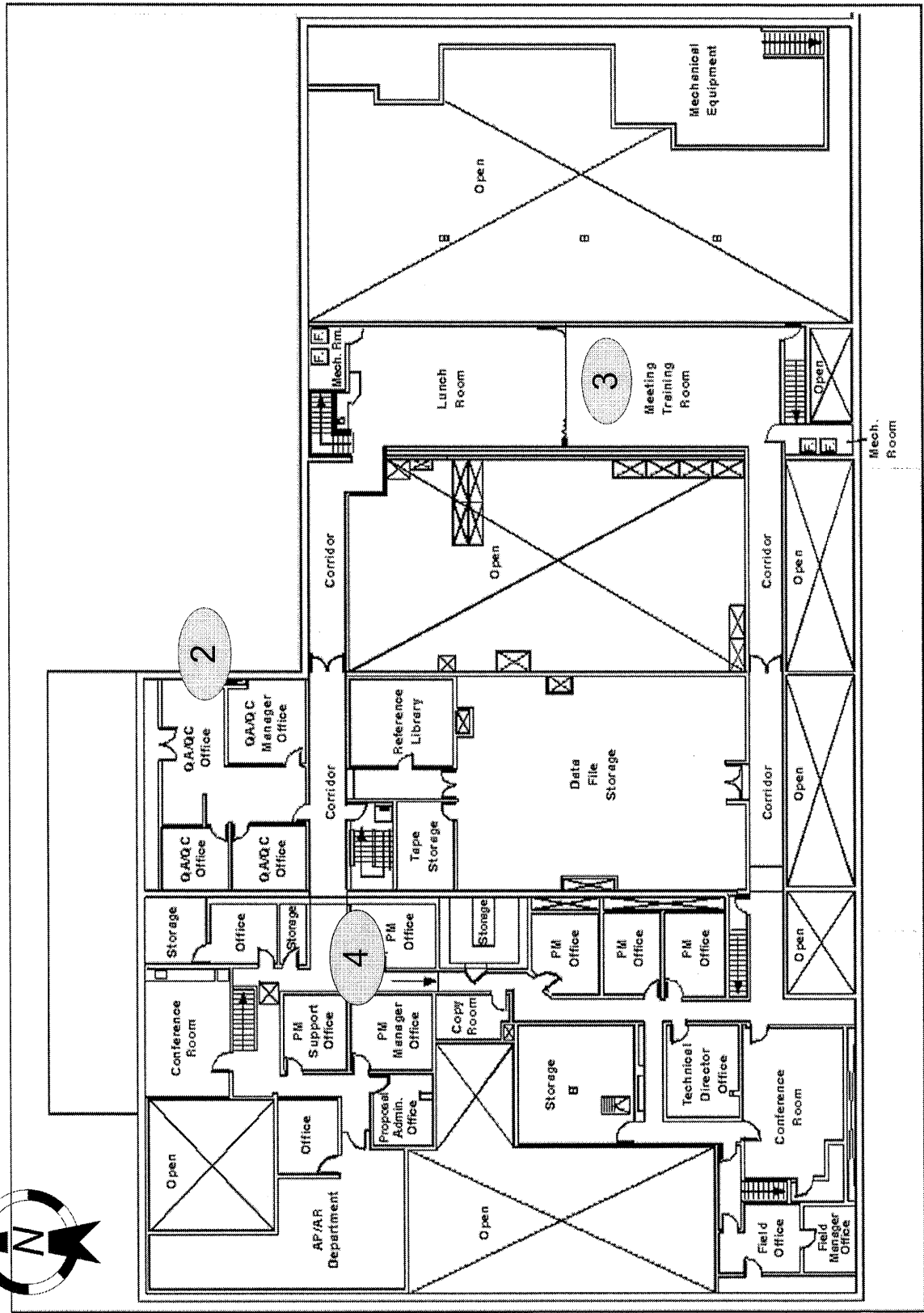
1. Report Generation
2. QA/QC
3. Training Center
4. Project Management
5. GC/MS
6. GC/QDA
7. Metals Instrument
8. BNA
9. PCB/Pesticide
10. Wet Chemistry
11. Metals & Mercury
12. Lachat
13. TOX Lab
14. Log-In
15. Bottle Project
16. Organic Extractions
17. LIMS/LAN

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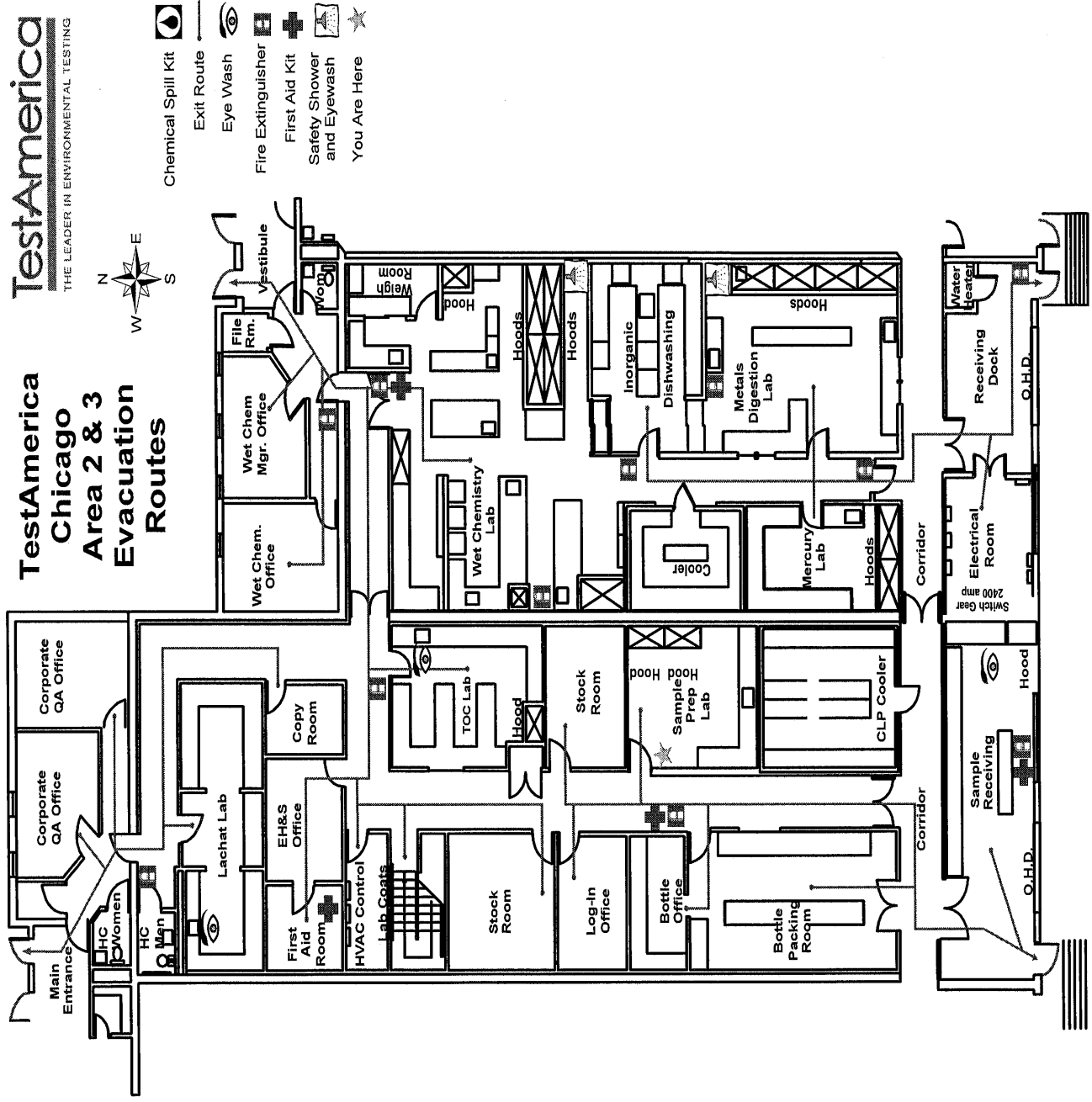
## THE LEADER IN ENVIRONMENTAL TESTING

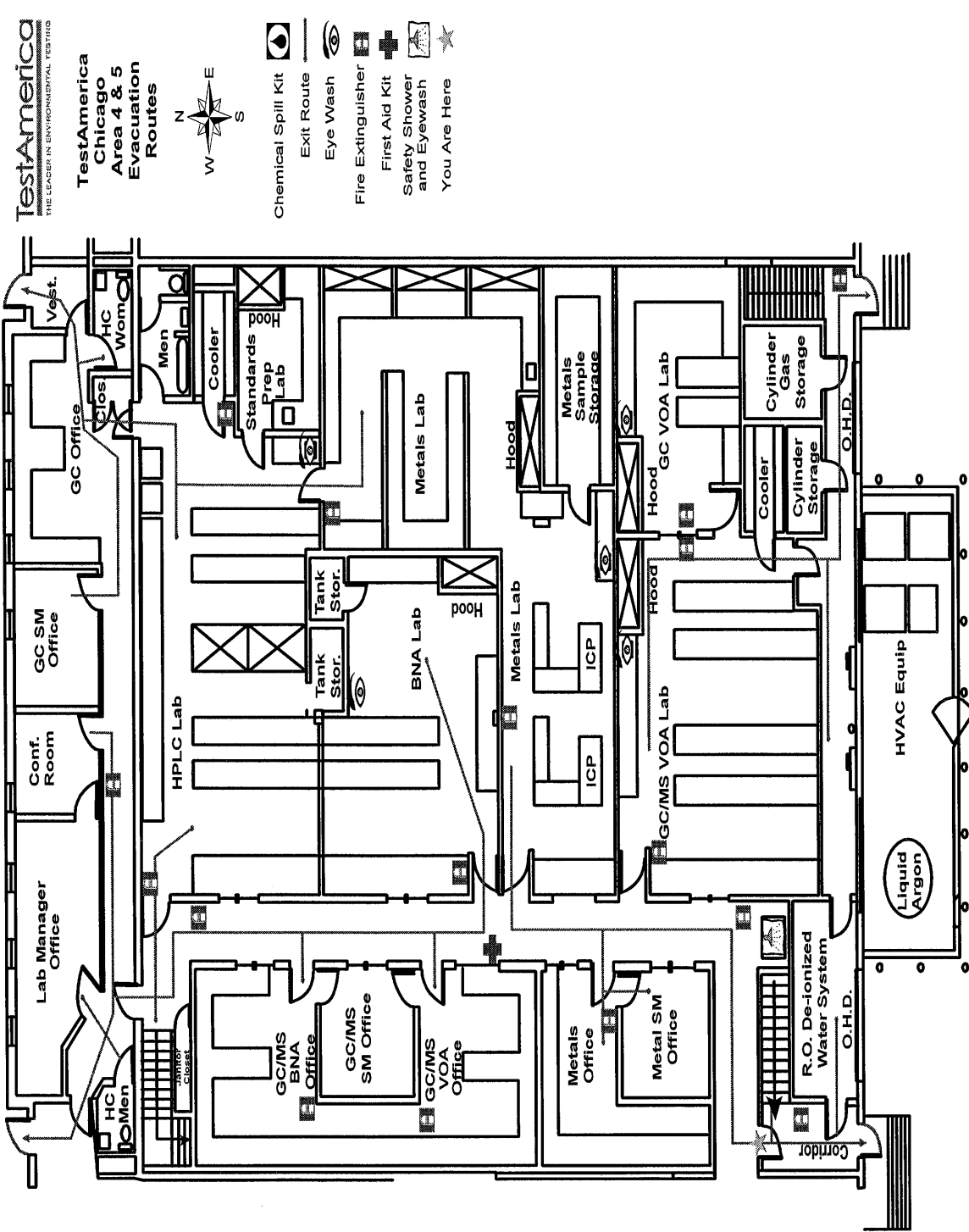


## Upper Floor Plan of TestAmerica Chicago



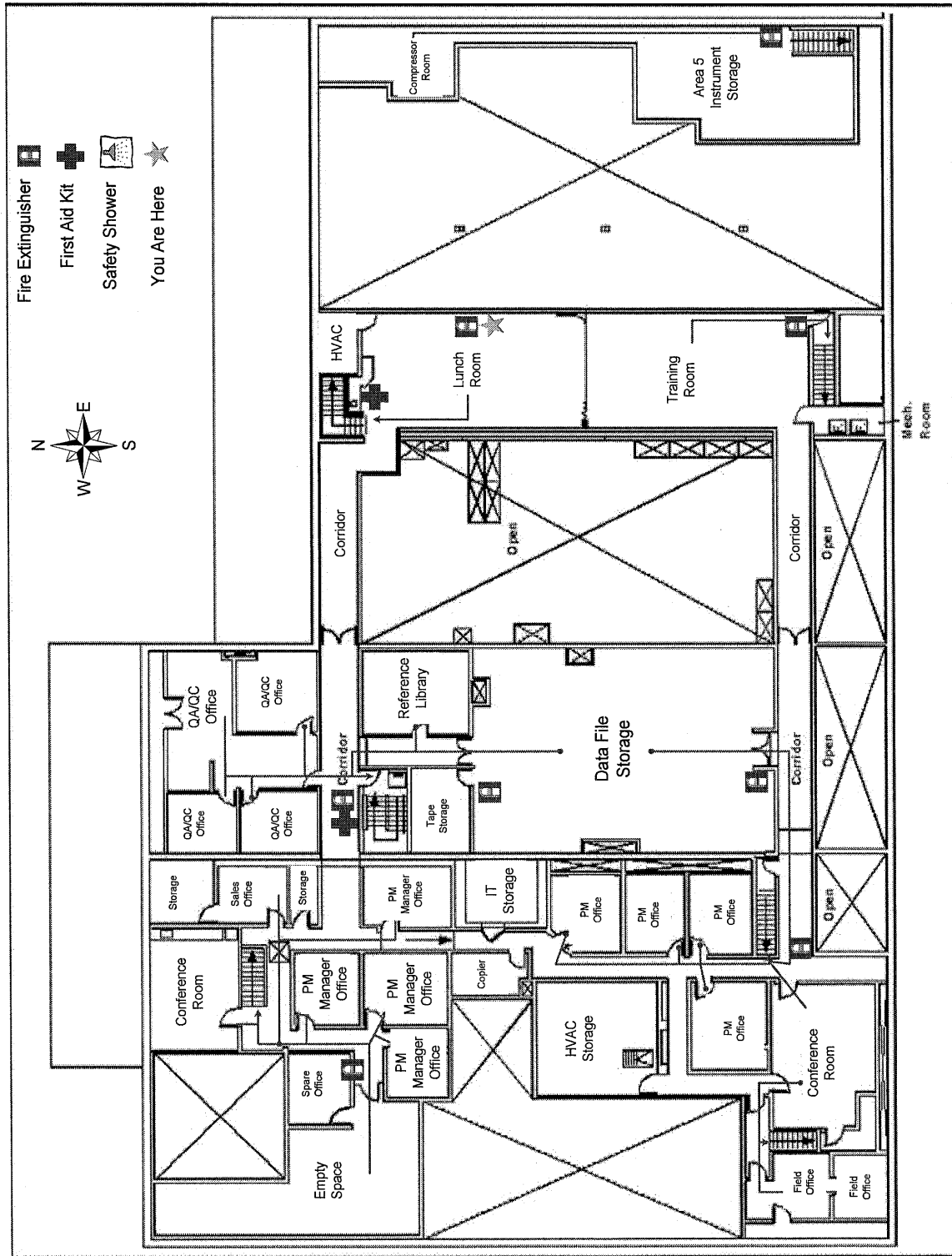
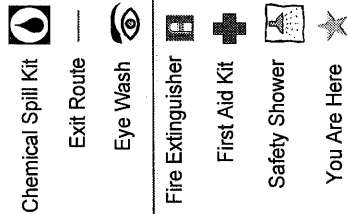








## Upper Floor Evacuation Routes & Emergency Equipment



Attachment 5:

**Emergency First Aid Response Hand out.**

In the event of an emergency that requires more than local first aid but not immediate medical assistance please follow the steps listed below:

1. Contact an employee on the first aid committee, EHSC, or department manager to assess and treat any wounds within their ability. All emergency contact numbers and safety committee team members can be located next to any facility phones. **Managers' phone numbers can be located in the EHSC office or the receptionist desk.**
2. Contact the EHSC (**Mark A. Storm 708-546-6200**) or the department manager and injured employees supervisor to begin the reporting procedure. The EHSC or department manager will determine if the injury requires further treatment by trained medical professionals.
3. If further medical attention is required the EHSC, supervisor, department manager, or safety committee member will perform the following duties before they exit the building for treatment.

**NOTE: If performing the following steps could jeopardize the safety of the injured employee; Call 9-911 and request that an ambulance be dispatched to the facility immediately!**

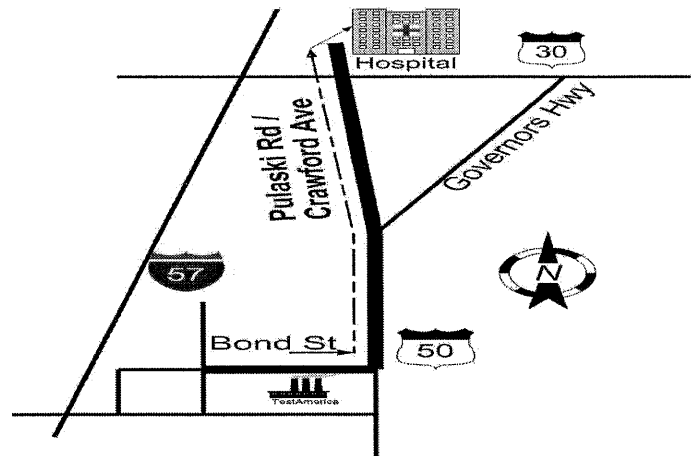
- a. Leave a message with the receptionist (from 8am-5pm) of who will be leaving the building.
- b. Call St James Occupational Health Olympia Fields Campus **708-503-3222**
  - i. Inform them of the injury
  - ii. Ask where you should bring the injured employee. Either emergency room or Occupational Health Center
  - iii. Be prepared to answer any questions the medical professionals may have and provide MSDS if necessary.

The injured employee **must** be accompanied to the hospital and must not be allowed to drive a vehicle.

**Address and Directions:**

**St James Occupational Health Olympia Fields**  
**20201 Crawford Ave**  
**Olympia Fields, IL 60461-1010**

1. Start out going **east** on **Bond St** toward **S Governors Hwy / IL-50**. Go **0.4 Mi**
2. Turn **left** onto **IL-50 / S Governors Hwy**. continue to follow **S Governors Hwy**. Go **5.2 Mi**
3. Stay **straight** to go onto **Pulaski Rd / Crawford Ave**. Go **1.0 Mi**
4. **20201 CRAWFORD AVE** is on the **right**.



5. At the medical facility the following information **MUST** be relayed:
  - a. Employees Name, phone number (working home number), home address, and any other personal information that is required by the medical facility about the injured employee.
  - b. It must be relayed to the hospital if the injury was work related.
  - c. Supply the hospital with the work address, phone number, and name of the TestAmerica contact Listed below:
    - i. Mark A. Storm Environmental Health and Safety Coordinator (708-546-6200)
    - ii. TestAmerica Phone 708-534-5200
    - iii. TestAmerica Address 2417 Bond St. University Park IL. 60484
  - d. **A 10 panel drug screen MUST be obtained from any employee that requires professional medical assistance.** Make sure that a 10 panel drug screen is performed on the injured employee.
6. After the visit to the medical facility please return the employee to the TestAmerica facility.
7. Copies of all paper work must be left with the EHSC and/or the HR manager
8. All follow up appointments **must be scheduled and attended** by the injured employee
9. The supervisor and EHSC must be informed of any follow up evaluations.

# TestAmerica

Document No. UP-QA\_QAM,Rev.05

Effective Date: 02/04/13


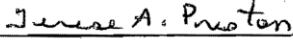

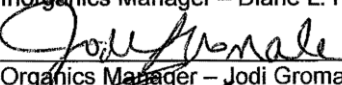
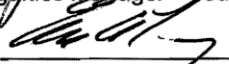

Page 1 of 203

THE LEADER IN ENVIRONMENTAL TESTING

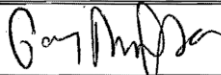

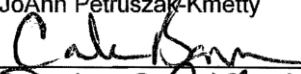
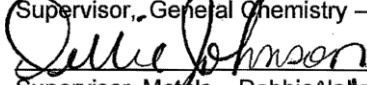
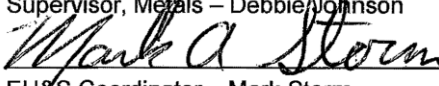
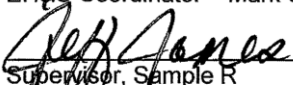
## Quality Assurance Manual

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2417 Bond Street  
University Park, IL 60484  
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Fax: 708-534-5211  
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### Quality Assurance Manual Approval Signatures

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	1/31/13
Quality Manager - Terese A. Preston	Date
	1/31/13
Inorganics Manager – Diane L. Harper	Date
	1/31/13
Organics Manager – Jodi Gromala	Date
	1/31/13
Customer Service Manager – Eric Lang	Date
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Report Production Manager – Paula Buckley	Date

Date

	2/1/13
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	1-31-13
Supervisor, GC, GC/MS Volatiles JoAnn Petruszak-Kmetty	Date
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Supervisor, General Chemistry – Carla Bonner	Date
	1/31/13
Supervisor, Metals – Debbie Johnson	Date
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EH&S Coordinator – Mark Storm	Date
	1/31/13
Supervisor, Sample R Jeff James	

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**SECTION 2****TABLE OF CONTENTS**

<b>Section No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005(E) Reference</b>	<b>Page No.</b>
1.0	COVER PAGE	V1M2 Sec. 4.2.8.3		COVER
2.0	TABLE OF CONTENTS	V1M2 Secs. 4.2.8.3-4.2.8.4		2
3.0	INTRODUCTION, SCOPE and APPLICABILITY	V1M2 Sec. 4.2.8.4		11
3.1	Introduction And Compliance References	V1M2 Secs. 1.1; 1.2; 2.0; 3.2; 4.1.2; 4.2.4	4.1.2; 4.2.4	11
3.2	Terms And Definitions	V1M2 Secs. 3.0; 4.2.4	4.2.4	11
3.3	Scope / Fields Of Testing	V1M2 Secs. 1.2; 4.2.4	4.1.2; 4.2.4	12
3.4	Management Of The Manual	V1M2 Secs. 4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	12
4.0	MANAGEMENT REQUIREMENTS	V1M2 Sec. 4		14
4.1	Overview	V1M2 Sec. 4.1.1; 4.1.3; 4.1.5	4.1.1; 4.1.3; 4.1.5; 4.2.6	14
4.2	Roles And Responsibilities	V1M2 Secs. 4.1.4; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	4.1.3; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	14
4.3	Deputies	V1M2 Secs. 4.1.5; 4.1.7.2; 4.2.7	4.1.5; 4.2.7	25
5.0	QUALITY SYSTEM			28
5.1	Quality Policy Statement	V1M2 Secs. 4.1.5; 4.2.2; 4.2.3; 4.2.8.3	4.1.5; 4.2.2; 4.2.3	28
5.2	Ethics And Data Integrity	V1M2 Secs. 4.1.5; 4.1.6; 4.2.2; 4.2.8.1; 5.2.7	4.1.5; 4.2.2	28
5.3	Quality System Supporting Documentation	V1M2 Secs. 4.1.5; 4.2.2; 4.2.5	4.2.2; 4.2.5	29
5.4	QA/QC Objectives for the Measurement of Data	V1M2 Sec. 4.2.2	4.1.5; 4.2.2	29
5.5	Criteria for Quality Indicators			31
5.6	Statistical Quality Control			32
5.7	Quality System Metrics			33
6.0	DOCUMENT CONTROL	V1M2 Secs. 4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	34
6.1	Overview			34
6.2	Document Approval And Issue	V1M2 Secs. 4.3.2; 4.3.2.1-4.3.2.3; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.2.3; 4.3.3.1	34
6.3	Procedures For Document Control Policy	V1M2 Secs. 4.3.2.1-4.3.2.2; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.3.1	35
6.4	Obsolete Documents	V1M2 Secs. 4.3.2.1-4.3.2.2	4.3.2.1; 4.3.2.2	35
7.0	SERVICE TO THE CLIENT	V1M2 Secs. 4.4.1-4.4.4	4.4.1; 4.4.2; 4.4.3; 4.4.4	36
7.1	Overview	V1M2 Secs. 4.4.5; 4.5.5; 5.7.1	4.4.5; 5.7.1	36
7.2	Review Sequence And Key Personnel	V1M2 Sec. 4.4.5	4.4.5	37
7.3	Documentation	V1M2 Sec. 5.7.1	5.7.1	38

Section No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
7.4	Special Services	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	39
7.5	Client Communication	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	39
7.6	Reporting	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	39
7.7	Client Surveys	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	39
8.0	SUBCONTRACTING OF TESTS	V1M2 Secs. 4.4.3; 4.5.4	4.4.3; 4.5.4	41
8.1	Overview	V1M2 Secs. 4.5.1-4.5.3; 4.5.5; 5.3.1	4.5.1; 4.5.2; 4.5.3; 5.3.1	41
8.2	Qualifying And Monitoring Subcontractors	V1M2 Secs. 4.5.1; 4.5.2; 4.5.3; 4.5.5	4.5.1; 4.5.2; 4.5.3	41
8.3	Oversight And Reporting	V1M2 Sec. 4.5.5		43
8.4	Contingency Planning			44
9.0	PURCHASING SERVICES AND SUPPLIES	V1M2 Sec. 4.6.1	4.6.1	47
9.1	Overview	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4	4.6.2; 4.6.3; 4.6.4	47
9.2	Glassware	V1M2 Sec. 5.5.13.1		47
9.3	Reagents, Standards & Supplies	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4	4.6.2; 4.6.3; 4.6.4	47
9.4	Purchase Of Equipment/Instruments/Software			49
9.5	Services			49
9.6	Suppliers			50
10.0	SERVICE TO THE CLIENT (refer to section 7.4 – 7.7)			53
11.0	COMPLAINTS	V1M2 Sec. 4.8	4.8	54
11.1	Overview			54
11.2	External Complaints			54
11.3	Internal Complaints			55
11.4	Management Review			55
12.0	CONTROL OF NON-CONFORMING WORK	V1M2 Secs. 4.9.1; 5.10.5	4.9.1; 5.10.5	56
12.1	Overview	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	56
12.2	Responsibilities And Authorities	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5; 5.2.7	4.9.1; 4.11.3; 4.11.5	56
12.3	Evaluation Of Significance And Actions Taken	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	57
12.4	Prevention Of Nonconforming Work	V1M2 Secs. 4.9.4; 4.11.2	4.9.2; 4.11.2	57
12.5	Method Suspension/Restriction (Stop Work Procedures)	V1M2 Secs. 4.9.1; 4.9.2; 4.11.5	4.9.1; 4.9.2; 4.11.5	58
13.0	CORRECTIVE ACTION	V1M2 Sec. 4.11		59
13.1	Overview	V1M2 Secs. 4.9.2; 4.11.1; 4.11.2	4.9.2; 4.11.1; 4.11.2	59
13.2	General	V1M2 Secs. 4.11.2; 4.11.3	4.11.2; 4.11.3	59
13.3	Closed Loop Corrective Action Process	V1M2 Secs. 4.11.2; 4.11.3; 4.11.4; 4.11.6; 4.11.7; 4.12.2	4.11.2; 4.11.3; 4.11.4; 4.12.2	60
13.4	Technical Corrective Actions	V1M2 Sec. 4.11.6		61
13.5	Basic Corrections	V1M2 Secs. 4.11.1; 4.13.2.3	4.11.1; 4.13.2.3	62
14.0	PREVENTIVE ACTION /IMPROVEMENT	V1M2 Secs. 4.10; 4.12.1; 4.12.2	4.10; 4.12.1; 4.12.2	65
14.1	Overview	V1M2 Secs. 4.15.1; 4.15.2	4.15.1; 4.15.2	65

<b>Section No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005 (E) Reference</b>	<b>Page No.</b>
14.2	Management Of Change			66
15.0	CONTROL OF RECORDS	V1M2 Secs. 4.2.7; 4.13.1.1; 4.13.3	4.2.7; 4.13.1.1	67
15.1	Overview	V1M2 Secs. 4.13.1.1; 4.13.1.2; 4.13.1.3; 4.13.1.4; 4.13.2.1; 4.13.2.2; 4.13.2.3; 4.13.3	4.13.1.1; 4.13.1.2; 4.13.1.3; 4.13.1.4; 4.13.2.1; 4.13.2.2; 4.13.2.3	67
15.2	Technical And Analytical Records	V1M2 Secs. 4.13.2.2-4.13.2.3	4.13.2.2; 4.13.2.3	70
15.3	Laboratory Support Activities			71
15.4	Administrative Records			72
15.5	Records Management, Storage And Disposal	V1M2 Sec. 4.13.3		72
16.0	AUDITS			74
16.1	Internal Audits	V1M2 Secs. 4.2.8.1; 4.14; 4.14.1; 4.14.2; 4.14.3; 4.14.5; 5.9.1; 5.9.2	4.14.1; 4.14.2; 4.14.3; 5.9.1; 5.9.2	74
16.2	External Audits	V1M2 Secs. 4.14.2; 4.14.3	4.14.2; 4.14.3; 4.14.4	75
16.3	Audit Findings	V1M2 Secs. 4.14.2; 4.14.3; 4.14.5		76
17.0	MANAGEMENT REVIEWS	V1M2 Secs. 4.1.6; 4.15; 4.15.1; 4.15.2	4.1.6; 4.15.1; 4.15.2	79
17.1	Quality Assurance Report			79
17.2	Annual Management Review	V1M2 Secs. 4.2.2; 4.15.3	4.2.2	79
17.3	Potential Integrity Related Managerial Reviews			80
18.0	PERSONNEL	V1M2 Secs. 5.2; 5.2.1	5.2.1	84
18.1	Overview	V1M2 Secs. 5.2.2; 5.2.3; 5.2.5	5.2.2; 5.2.3; 5.2.5	84
18.2	Education And Experience Requirements For Technical Personnel	V1M2 Secs. 5.2.1; 5.2.3; 5.2.4	5.2.1; 5.2.3; 5.2.4	84
18.3	Training	V1M2 Sec. 5.2.5	5.2.5	85
18.4	Data Integrity And Ethics Training Program	V1M2 Secs. 4.2.8.1; 5.2.7		86
19.0	ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS	V1M2 Sec. 5.3		88
19.1	Overview	V1M2 Secs. 5.3.1; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.3; 5.3.4; 5.3.5	88
19.2	Environment	V1M2 Secs. 5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	88
19.3	Work Areas	V1M2 Secs. 5.3.3; 5.3.4; 5.3.5	5.3.3; 5.3.4; 5.3.5	89
19.4	Floor Plan			89
19.5	Building Security	V1M2 Sec. 5.3.4	5.3.4	89
20.0	TEST METHODS AND METHOD VALIDATION	V1M2 Sec. 5.4.1	5.4.1	90
20.1	Overview	V1M2 Sec. 5.4.1	5.4.1; 5.4.5.1	90
20.2	STANDARD OPERATING PROCEDURES (SOPs)	V1M2 Secs. 4.2.8.5; 4.3.3.1; 5.4.2	4.3.3.1; 5.4.2	90
20.3	Laboratory Methods Manual	V1M2 Sec. 4.2.8.5		90

Section No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
20.4	Selection Of Methods	V1M2 Secs. 4.13.3; 5.4.1; 5.4.2; 5.4.3; V1M4 Secs. 1.4; 1.5.1; 1.6.1; 1.6.2; 1.6.2.1; 1.6.2.2	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5.1; 5.4.5.2; 5.4.5.3	91
20.5	Laboratory Developed Methods And Non-Standard Methods	V1M2 Sec. 5.4.2 V1M4 Sec. 1.5.1	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	94
20.6	Validation Of Methods	V1M2 Sec. 5.4.2 V1M4 Secs. 1.5.1; 1.5.2; 1.5.2.1; 1.5.2.2; 1.5.3	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	94
20.7	Method Detection Limits (MDL) / Limits of Detection (LOD)	V1M2 Sec. 5.9.3 V1M4 Secs. 1.5.2; 1.5.2.1; 1.5.2.2	5.4.5.3	95
20.8	Instrument Detection Limits (IDL)	V1M2 Sec. 5.9.3		97
20.9	Verification Of Detection And Reporting Limits	V1M2 Sec. 5.9.3 V1M4 Sec. 1.5.2.1		97
20.10	Retention Time Windows	V1M2 Sec. 5.9.3		97
20.11	Evaluation Of Selectivity	V1M2 Sec. 5.9.3; V1M4 Secs. 1.5.4; 1.7.3.6		98
20.12	Estimation Of Uncertainty Of Measurement	V1M2 Secs. 5.1.1; 5.1.2; 5.4.6	5.1.1; 5.1.2; 5.4.6.1; 5.4.6.2; 5.4.6.3	98
20.13	Sample Reanalysis Guidelines	V1M2 Sec. 5.9.1	5.9.1	99
20.14	Control Of Data	V1M2 Secs. 5.4.7.1; 5.4.7.2; 5.9.1	5.4.7.1; 5.4.7.2; 5.9.1;	100
21.0	EQUIPMENT AND CALIBRATIONS	V1M2 Secs. 5.5.4; 5.5.5; 5.5.6	5.5.4; 5.5.5; 5.5.6; 5.6.1	107
21.1	Overview	V1M2 Secs. 5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10	5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10; 5.6.1	107
21.2	Preventive Maintenance	V1M2 Secs. 5.5.1; 5.5.3; 5.5.7; 5.5.9	5.5.1; 5.5.3; 5.5.7; 5.5.9; 5.6.1	107
21.3	Support Equipment	V1M2 Secs. 5.5.10; 5.5.11; 5.5.13.1	5.5.10; 5.5.11; 5.6.2.1.2; 5.6.2.2.1; 5.6.2.2.2	108
21.4	Instrument Calibrations	V1M2 Secs. 5.5.8; 5.5.10; 5.6.3.1 V1M4 Secs. 1.7.1.1; 1.7.2	5.5.8; 5.5.9; 5.5.10; 5.6.1; 5.6.2; 5.6.3.1	110
21.5	Tentatively Identified Compounds (TICs) – GC/MS Analysis			117
21.6	GC/MS Tuning			118
22.0	MEASUREMENT TRACEABILITY			126
22.1	Overview	V1M2 Sec. 5.6.3.1	5.6.2.1.2; 5.6.2.2.2; 5.6.3.1	126
22.2	NIST-Traceable Weights and Thermometers	V1M2 Secs. 5.5.13.1; 5.6.3.1; 5.6.3.2	5.6.3.1; 5.6.3.2	127
22.3	Reference Standards / Materials	V1M2 Secs. 5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.6.4.1; 5.6.4.2; 5.9.1; 5.9.3	5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.9.1	127
22.4	Documentation And Labeling Of Standards, Reagents, And Reference Materials	V1M2 Secs. 5.6.4.2; 5.9.3		128
23.0	SAMPLING			131
23.1	Overview	V1M2 Secs. 5.7.1; 5.7.3	5.7.1; 5.7.3	131
23.2	Sampling Containers			131
23.3	Field Quality Control (QC)		5.7.1	132
23.4	Definition Of Holding Time			132

<b>Section No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005 (E) Reference</b>	<b>Page No.</b>
23.5	Sampling Containers, Preservation Requirements, Holding Times			133
23.6	Sample Aliquots / Subsampling	V1M2 Sec. 5.7.1	5.7.1	133
24.0	HANDLING OF SAMPLES	V1M2 Sec. 5.8.1	5.8.1	135
24.1	Chain of Custody (COC)	V1M2 Secs. 5.7.2; 5.7.4; 5.8.4; 5.8.7.5; 5.8.8; 5.9.1	5.7.2; 5.8.4; 5.9.1;	135
24.2	Sample Receipt	V1M2 Secs. 5.8.1; 5.8.2; 5.8.3; 5.8.5; 5.8.7.3; 5.8.7.4; 5.8.7.5	5.8.2; 5.8.3	136
24.3	Sample Acceptance Policy	V1M2 Secs. 5.8.6; 5.8.7.2		139
24.4	Sample Storage	V1M2 Secs. 5.7.4; 5.8.4	5.8.4	139
24.5	Hazardous Samples and Foreign Soils			140
24.6	Sample Shipping	V1M2 Sec. 5.8.2	5.8.2	140
24.7	Sample Disposal			140
25.0	ASSURING THE QUALITY OF TEST RESULTS			146
25.1	Overview	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	146
25.2	Controls	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	146
25.3	Negative Controls	V1M2 Secs. 5.9.2; 5.9.3 V1M4 Secs. 1.7.3; 1.7.3.1; 1.7.4.1	5.9.2	146
25.4	Positive Controls	V1M2 Secs. 5.9.2; 5.9.3 V1M4 Secs. 1.7.3; 1.7.3.2; 1.7.3.2.1; 1.7.3.2.2; 1.7.3.2.3	5.9.2	147
25.5	Sample Matrix Controls	V1M2 Secs. 5.9.2; 5.9.3 V1M4 Secs. 1.7.3; 1.7.3.3; 1.7.3.3.1; 1.7.3.3.2; 1.7.3.3.3	5.9.2	149
25.6	Acceptance Criteria (Control Limits)	V1M2 Sec. 5.9.3 V1M4 Secs. 1.7.4.2; 1.7.4.3		150
25.7	METHOD DETECTION LIMITS (MDLs)			153
25.8	Additional Procedures To Assure Quality Control	V1M2 Sec. 5.9.3 V1M4 Sec. 1.7.3.4		153
26.0	REPORTING RESULTS			154
26.1	Overview	V1M2 Secs. 5.10.1; 5.10.2; 5.10.8	5.10.1; 5.10.2; 5.10.8	154
26.2	Test Reports	V1M2 Secs. 5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8; 5.10.10; 5.10.11	5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8	154
26.3	Reporting Level or Report Type	V1M2 Secs. 5.10.1; 5.10.7; 5.10.8	5.10.1; 5.10.7; 5.10.8	156
26.4	Supplemental Information for Test	V1M2 Secs. 5.10.1; 5.10.3.1; 5.10.5	5.10.1; 5.10.3.1; 5.10.5	157
26.5	Environmental Testing Obtained From Subcontractors	V1M2 Secs. 4.5.5; 5.10.1; 5.10.6	5.10.1; 5.10.6	158
26.6	Client Confidentiality	V1M2 Secs. 4.1.5; 5.10.7	4.1.5; 5.10.7	158
26.7	Format of Reports	V1M2 Sec. 5.10.8	5.10.8	158

<b>Section No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005 (E) Reference</b>	<b>Page No.</b>
26.8	Amendments to Test Reports	V1M2 Sec. 5.10.9	5.10.1; 5.10.9	158
26.9	Policies On Client Requests For Amendments	V1M2 Secs. 5.9.1; 5.10.9	5.9.1; 5.10.1; 5.10.5; 5.10.9	159

## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005 (E) Reference</b>	<b>Page No.</b>
9-1	Storage of Reagents and Chemicals			51
13-1	Example- General Corrective Action Procedures	V1M2 Sec. 4.11.6 V1M4 Sec. 1.7.4.1	4.11.2	64
15-1	Example - Record Index		4.13.1.1	67
15-2	Example - Special Record Retention Requirements			69
16-1	Types of Internal Audits and Frequency		4.14.1	74
21-1	Example – Instrumentation List		5.5.4; 5.5.5	120
21-2	Example – Schedule of Routine Maintenance			124
22-1	Example – Standard Sources & Preparation		5.9.1	130

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>	<b>2009 TNI Standard Reference</b>	<b>ISO/IEC 17025:2005 (E) Reference</b>	<b>Page No.</b>
3-1	Example – Policy/Procedure Memorandum		4.3.3.2; 4.3.3.3	13
4-1	Corporate Organizational Chart	V1M2 Sec. 4.1.5	4.1.3; 4.1.5; 4.2.6	26
4-2	TestAmerica Chicago Organizational Chart		4.1.3; 4.1.5; 4.2.6	27
7-1	Example – Report/Project Feedback			40
8-1	Example - Subcontracting Laboratory Approval Form (Initial / Renewal)			45
8-2	Example - Subcontracted Sample Form			46
9-1	Materials Request Sheet			51
9-2	Example - JD Edwards Vendor Add Request Form			52
13-1	Example – Non-Conformance Memo		4.11.2; 4.13.2.3	63

COMPANY CONFIDENTIAL AND PROPRIETARY

Figure No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
16-1	Example – Internal Audit Workbook		4.14.1; 4.14.3	77
16-2	Example – Internal Audit System Checklist		4.14.3	78
17-1	Example - QA Monthly Report to Management		4.15.1	80
17-2	Example – Laboratory QS Metrics Categories		4.15.1	82
20-1	Example – Demonstration of Capability Documentation			104
20-2	Example – New Instrument/Method/Additional Analyte Checklist			105
20-3	Work Flow			106
24-1	Example – Chain of Custody			142
24-2	Example - Custody Seal			143
24-3	Example – Internal Chain of Custody Form			143
24-4	Example – Sample Disposal Record			143
24-5	Example – Sample Acceptance Policy	V1M2 Sec. 5.8.6; 5.8.7.1 V1M4 Sec. 1.7.5		144
24-6	Example – Cooler Receipt Form		5.8.3	145

## LIST OF APPENDICES

Appendix No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
1	TestAmerica Ethics Policy No. CW-L-P-004		4.1.5	160
2	Laboratory Floor Plan			163
3	Summary of Calibration, QC Procedures and Corrective Action			165
4	Glossary / Acronyms			189
5	Laboratory Certifications, Accreditations, Validations			199
6	Data Qualifiers – Standard Flagging Suite			200
7	Method Capability Listing		4.2.5	201

COMPANY CONFIDENTIAL AND PROPRIETARY

## REFERENCED CORPORATE SOPs AND POLICIES

SOP/Policy Reference	Title	Cited Section No(s)
CA-C-S-001	Work Sharing Process	8.1; 8.2
CA-I-P-002	Electronic Reporting and Signature Policy	26.2.25
CW-L-P-004	Company-Wide Ethics Policy	5.2; 18.4; Appendix I
CA-L-P-002	Contract Compliance Policy	7.2
CW-L-S-002	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall	5.2; 12.2; 12.3; 13.4; Table 13.1; 17.1; 17.3
CA-L-S-002	Subcontracting Procedures	8.1, 8.2; 26.5
CA-Q-M-002	Corporate Quality Management Plan (CQMP)	3.1; 3.4.1; 4.1; 4.2.1; 4.2.2; 5.3.1
CA-Q-S-001	Acid and Solvent Lot Testing and Approval	9.3; 22.4
CA-Q-S-002	Acceptable Manual Integration Practices	20.14.2; 20.14.4; 20.14.5
CW-Q-S-003	Internal Auditing	16.1
CA-Q-S-005	Calibration Curves (General)	21.4.2.1; 21.4.2.3; 21.4.2.7
CA-Q-S-006	Detection Limits	20.7
CW-Q-S-004	Management Systems Review	17.2
CW-Q-WI-003	Management Review	17.2
CA-T-P-001	Qualified Products List	9.4
CW-E-M-001	Environmental Health & Safety Manual	9.3.4
CW-F-P-002	Company-Wide Authorization Matrix Policy	9.1
CW-F-P-004	Procurement & Contracts Policy	9.1; 9.6
CW-F-S-007	Capital Expenditure Request and Controlled Purchases	9.1
CW-F-S-026	Procurement of Subcontract Services	8.1
CW-F-WI-007	J.D. Edwards Vendor Add Request Form	9.6.1
CW-F-WI-009	Vendor Performance Report	8.2.3; 9.6
CW-L-P-001	Record Retention	15.1.1; 15.5.6.3
CW-Q-S-001	Corporate Document Control and Archiving	6.1; 6.3
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)	6.3; 20.2

COMPANY CONFIDENTIAL AND PROPRIETARY

Document No. UP-QA\_QAM,Rev.05

Effective Date: 02/04/13

Page 10 of 203

## REFERENCED LABORATORY SOPs

SOP Reference	Title	Cited Section No(s)
UP-DM-002	Data Management: Record Retention & Purging	6.4; 15.0; 15.1; 15.1.3; 15.1.4
UP-FS-001	Field Services; Groundwater Sampling – Bailing Method	23.1
UP-IS-014	Proc/Processes Entry, Storage, Backup/Retrieval, Mgmt Bench Data	15.0; 15.1; 15.1.4; 20.14.1
UP-QA-003	Balance Calibration, Care and Use	21.3.1
UP-QA-006	Document Control	3.4.1; 6.1; 6.3; 20.2
UP-QA-014	Training Program: Mechanisms and Documentation Processes Defined by Operational Assessment	18.3
UP-QA-017	Method Detection Limits	20.7; 20.7.5; 20.7.6; 20.9.1
UP-QA-022	Refrigerated Storage Monitoring Volatile Samples	24.4
UP-QA-032	SOP Change Protocol	3.4.1; 6.3; 20.2
UP-QA-034	Thermometer Calibrations	21.3.3
UP-QA-039	Sample Homogenization Sub Sampling Procedures	23.6
UP-QA-040	Quality Assurance – Measurement Uncertainty	20.12.4
UP-SR-001	Sample Receipt: Handling and Processing Procedures	24.2; 24.2.1.8; 24.2.2; Figure 24-5
UP-WM-001	Laboratory Waste Disposal Procedures	24.7

COMPANY CONFIDENTIAL AND PROPRIETARY

## Standard Operating Procedures Listing for TestAmerica Chicago

Dept	Document Number	Revision	Active Date	SOP TITLE	Document Type
Sample Container Management	UP-CM-001,Rev.14	14	08/31/12	Process Operation: Container Management	SOP
Data Management	UP-DM-001, Rev.16	16	05/24/13	Process Operation: Data Management	SOP
Data Management	UP-DM-002, Rev.19	19	05/24/13	Record Retention and Purging	SOP
Facility Management	UP-FM-001,Rev.17	17	01/11/13	Laboratory Access and Security	SOP
Facility Management	UP-FM-002,Rev.06	6	04/26/13	Addendum - Environmental Health & Safety Manual	SOP
Field Sampling	UP-FS-001.Rev.07	7	08/31/12	Field Services: Groundwater Sampling-Bailing Method	SOP
Field Sampling	UP-FS-002.Rev.02	2	08/31/12	Field Services: Courier Responsibilities	SOP
Gas Chromatography - Semivolatiles	UP-GE-608,Rev.16	16	08/27/12	Pesticides/PCBs: EPA 608	SOP
Gas Chromatography - Semivolatiles	UP-GE-8081,Rev.15	15	08/27/12	Pesticides/PCBs: SW-846 8081A & 8081B	SOP
Gas Chromatography - Semivolatiles	UP-GE-8082,Rev.15	15	09/28/12	PCBs: SW-846 8082 & 8082A	SOP
Gas Chromatography - Semivolatiles	UP-GE-8151A,Rev.17	17	07/31/13	Herbicides: SW-846 8151A	SOP
Gas Chromatography - Semivolatiles	UP-GE-DRO,Rev.16	16	10/05/12	Diesel Range Organics (DRO)	SOP
Gas Chromatography - Semivolatiles	UP-GE-WI DRO,Rev.10	10	01/11/13	Wisconsin DRO Method	SOP
Gas Chromatography - Volatiles	UP-GV-GRO, Rev.16	16	10/05/12	Gasoline Range Organics (GRO)	SOP
Health & Safety	UP-HS-002,Rev.15	15	01/11/13	Minor Repair of Laboratory Glassware	SOP
Health & Safety	UP-HS-003,Rev.15	15	01/11/13	Measuring Hood Velocity	SOP
Health & Safety	UP-HS-004,Rev.15	15	01/11/13	Lock-out/Tag-out Procedures	SOP

Information Systems (LIMS)	UP-IS-001,Rev.12	12	01/21/13	EDD Specifications, Development, Generation & Review - General Formats	SOP
Information Systems (LIMS)	UP-IS-006,Rev.09	9	01/21/13	Procedures and Processes Related to Entry, Storage, Back-up/Retrieval and Management of Bench Level Electronic Data	SOP
Information Systems (LIMS)	UP-IS-014,Rev.08	8	12/12/12	IT Procedure	SOP
HPLC Analysis	UP-LC-8310,Rev.20	20	09/28/12	PAHs: SW-846 8310 & EPA 610	SOP
Gas Chromatography Mass Spectrophotometer - Semivolatiles	UP-MB-625,Rev.16	16	11/30/12	EPA 625	SOP
Gas Chromatography Mass Spectrophotometer - Semivolatiles	UP-MB-8270,Rev.21	21	11/30/12	SW-846 8270C	SOP
Gas Chromatography Mass Spectrophotometer - Semivolatiles	UP-MB-8270D,Rev.04	4	11/30/12	SW-846 8270D	SOP
Gas Chromatography Mass Spectrophotometer - Semivolatiles	UP-MB-8270 SIM,Rev.12	12	09/06/13	SW-846 8270C Selective Ion Monitoring (SIM) (Hallowaxes & 1,4-Dioxane)	SOP
Metals Analysis	UP-ME-200.7,Rev.15	15	09/06/13	Trace ICAP: EPA 200.7	SOP
Metals Analysis	UP-ME-200.8,Rev.07	7	07/31/13	ICP MS: EPA 200.8	SOP
Metals Analysis	UP-ME-245.1,Rev.18	18	10/31/12	Mercury: EPA 245.1/245.5; SW-846 7470A/7471A/7471B	SOP
Metals Analysis	UP-ME-6010B,Rev.15	15	09/28/12	Trace ICAP: SW-846 6010B (Simultaneous Operation)	SOP
Metals Analysis	UP-ME-6010C,Rev.03	3	09/28/12	Trace ICAP: SW-846 6010C (Simultaneous Operation)	SOP
Metals Analysis	UP-ME-6020,Rev.07	7	04/30/13	ICP MS: SW-846 6020 & 6020A	SOP
Gas Chromatography Mass Spectrophotometer - Volatiles	UP-MV-624,Rev.17	17	09/06/13	EPA 624	SOP

Gas Chromatography Mass Spectrophotometer - Volatiles	UP-MV-8260,Rev.23	23	12/05/12	SW-846 8260B	SOP
Program Management	UP-PM-001,Rev.16	16	02/28/13	Forecasting Laboratory Workload	SOP
Program Management	UP-PM-002,Rev.16	16	01/21/13	Project Kick-off Meetings	SOP
Program Management	UP-PM-003,Rev.15	15	01/21/13	Project Planning Process	SOP
Program Management	UP-PM-004,Rev.15	15	01/25/13	Production Meetings	SOP
Quality Assurance	UP-QA-QAM,Rev.05	5	02/04/13	TestAmerica Chicago Quality Assurance Manual	SOP
Quality Assurance	UP-QA-001,Rev.16	16	11/16/12	Laboratory and Electronic Logbooks	SOP
Quality Assurance	UP-QA-002;Rev.14	14	06/27/12	Quality System Assessment by Management	SOP
Quality Assurance	UP-QA-003,Rev.16	16	11/20/12	Balance Calibration, Care and Use	SOP
Quality Assurance	UP-QA-004,Rev.13	13	11/16/12	Client Confidentiality	SOP
Quality Assurance	UP-QA-006,Rev.19	19	11/16/12	Document Control	SOP
Quality Assurance	UP-QA-007,Rev.19	19	07/31/13	Eppendorf Calibration	SOP
Quality Assurance	UP-QA-009,Rev.17	17	11/16/12	Glassware Cleaning	SOP
Quality Assurance	UP-QA-010, Rev.13	13	05/31/13	IDLs for Metals & General Chemistry Parameters	SOP
Quality Assurance	UP-QA-011,Rev.14	14	05/24/13	Inspection of Supplies Upon Receipt	SOP
Quality Assurance	UP-QA-012,Rev.15	15	11/16/12	Instrument & Equipment Out-of-Service Tagging	SOP
Quality Assurance	UP-QA-013,Rev.14	14	07/03/13	Internal Audits	SOP
Quality Assurance	UP-QA-014, Rev.15	15	07/31/13	Laboratory Training - Skills and Mechanism	SOP
Quality Assurance	UP-QA-017,Rev.14	14	10/19/12	Method Detection Limit (MDL) Studies	SOP
Quality Assurance	UP-QA-018,Rev.16	16	02/15/13	PT Sample Tracking/Analysis	SOP
Quality Assurance	UP-QA-019,Rev.14	14	05/31/13	Preventive Action Measures	SOP
Quality Assurance	UP-QA-020, Rev.16	16	05/24/13	Procurement QA Process	SOP
Quality Assurance	UP-QA-022,Rev.17	17	08/16/13	Refrigerated Storage Monitoring - Vol. Samples	SOP
Quality Assurance	UP-QA-029;Rev.16	16	02/15/13	Corrective Action Reports / Non-Conformance Memos	SOP
Quality Assurance	UP-QA-030,Rev.17	17	05/24/13	Signature Authority	SOP
Quality Assurance	UP-QA-032,Rev.15	15	11/16/12	SOP Change Protocol	SOP
Quality Assurance	UP-QA-034,Rev.16	16	11/20/12	Thermometer Calibrations	SOP
Quality Assurance	UP-QA-035, Rev. 15	15	10/19/12	Water Quality	SOP
Quality Assurance	UP-QA-039,Rev.08	8	12/12/12	Sample Homogenization and Subsampling Procedures	SOP

Quality Assurance	UP-QA-040,Rev.08	8	11/16/12	Quality Assurance - Measurement Uncertainty	SOP
Quality Assurance	UP-QA-041,Rev.04	4	05/24/13	Quality Assurance - Certification of Lead Auditors	SOP
Sample Management	UP-SM-001,Rev.09	9	08/30/13	Subcontracting /Work Sharing Processes	SOP
Sample Preparation	UP-SP-200.0,Rev.20	20	02/15/13	Water Digestion for ICAP/ICPMS: EPA 200.7; 200.8	SOP
Sample Preparation	UP-SP-3000,Rev.22	22	12/19/12	Metals Digestions: SW-846 3000 Series (All Matrices)	SOP
Sample Preparation	UP-SP-2540G,Rev.17	17	05/24/13	Determination of Total, Fixed & Volatile Solids: %Ash / %Moisture / %Solids / %Volatiles	SOP
Sample Preparation	UP-SP-1311,Rev.18	18	02/15/13	Toxicity Characteristic Leaching Procedure (TCLP)	SOP
Sample Preparation	UP-SP-1312,Rev.15	15	08/30/13	Synthetic Precipitation Leaching Procedure (SPLP)	SOP
Sample Preparation	UP-SP-3987,Rev.09	9	02/15/13	Neutral Leach	SOP
Sample Preparation	UP-SP-MDEQ213,Rev.08	8	12/14/12	Soil Fraction Preparation for Lead Analysis	SOP
Sample Preparation	UP-SP-Turbidity,Rev.08	8	12/07/12	Metals: Drinking Water-Turbidity Measurement	SOP
Sample Preparation	UP-SP-5035,Rev.11	11	10/19/12	Laboratory Handling, Transfer/Preservation of VOA Soil samples received in EnCore Samplers for 5035/5035A and 5030B	SOP
Sample Preparation	UP-SP-003,Rev.13	13	10/31/12	Extractions: Clean-Up Procedures for GC & GC/MS Extracts	SOP
Sample Preparation	UP-SP-006,Rev.11	11	10/31/12	Extractions: Herbicides from Soils (8151A)	SOP
Sample Preparation	UP-SP-007,Rev.11	11	10/31/12	Extractions: Herbicides from a Wastewater Matrix or TCLP Extract, SW-846 8151A	SOP
Sample Preparation	UP-SP-009,Rev.16	16	07/08/13	Extractions: PCBs from Wipes	SOP
Sample Preparation	UP-SP-3510,Rev.13	13	02/25/13	Semivolatile and Nonvolatile Organic Compounds from a Wastewater or Leachate Matrix using Separatory Funnel Extraction	SOP

Sample Preparation	UP-SP-3541,Rev.11	11	10/31/12	Semivolatile and Nonvolatile Organic Compounds from a Soil/Sediment Matrix using Soxhlet Extraction	SOP
Sample Preparation	UP-SP-3550,Rev.12	12	07/08/13	Extraction - Soils (BNAs, Pesticides, PCBs, OP Pesticides, PAHs and DRO)	SOP
Sample Preparation	UP-SP-3580,Rev.11	11	06/05/13	Extractions: Semi-Vol. & Non-Vol. Org. Cmpds. from Waste/Oil Matrices	SOP
Sample Receipt & Handling	UP-SR-001,Rev.26	26	02/11/13	Sample Receipt and Handling	SOP
Wet Chemistry	UP-WC-1010,Rev.16	16	11/14/12	Flashpoint	SOP
Wet Chemistry	UP-WC-SpecCond, Rev15	15	10/12/12	Specific Conductance	SOP
Wet Chemistry	UP-WC-pH, Rev.16	16	08/30/13	pH, Electrometric	SOP
Wet Chemistry	UP-WC-TDS,Rev.16	16	01/11/13	Total & Volatile Dissolved Solids	SOP
Wet Chemistry	UP-WC-TSS,Rev.16	16	01/11/13	Total & Volatile Suspended Solids	SOP
Wet Chemistry	UP-WC-TotSolids,Rev.14	15	10/12/12	Total Solids	SOP
Wet Chemistry	UP-WC-2540F,Rev.15	15	01/10/13	Settleable Solids	SOP
Wet Chemistry	UP-WC-2330,Rev.15	15	01/11/13	Langelier Index	SOP
Wet Chemistry	UP-WC-2710F,Rev.13	13	01/10/13	Specific Gravity/Density	SOP
Wet Chemistry	UP-WC-300.0,Rev.14	14	11/28/12	Inorganic Ions by Ion Chromatography	SOP
Wet Chemistry	UP-WC-Alkalinity,Rev.14	14	02/28/13	Alkalinity	SOP
Wet Chemistry	UP-WC-Chloride_AQ2, Rev.06	6	11/05/12	Chloride by AQ2 Seal	SOP
Wet Chemistry	UP-WC-ResCl,Rev.14	14	08/30/13	Chlorine, Total & Free Residual	SOP
Wet Chemistry	UP-WC-CN,Rev.24	24	10/26/12	Cyanide: Total, Weak Acid Dissociable, Amenable, Reactive	SOP
Wet Chemistry	UP-WC-CN_LL,Rev.00	0	09/13/13	Cyanide_Low Level: Total & Weak Acid Dissociable	SOP
Wet Chemistry	UP-WC_Thiocyanate	0	09/13/13	Thiocyanate	SOP
Wet Chemistry	UP-WC-Fluoride,Rev.15	15	02/18/13	Fluoride: Ion Selective Electrode (ISE)	SOP
Wet Chemistry	UP-WC-NH3_AutoPhenate, Rev.0	0	10/31/12	Ammonia: Total/Unionized_Automated Phenate Method	SOP
Wet Chemistry	UP-WC-NH3_AutoPhenate_LL, Rev.0	0	Pending	Ammonia: Total/Unionized_Automated Phenate Low Level Method	SOP

Wet Chemistry	UP-WC-218.6,Rev.00	0	08/30/13	Chromium, Hexavalent by IC_218.6	SOP
Wet Chemistry	UP-WC-3500CrB,Rev.17	17	09/28/12	Chromium, Hexavalent and Trivalent	SOP
Wet Chemistry	UP-WC-3500FeB,Rev.12	12	11/16/12	Ferrous Iron	SOP
Wet Chemistry	UP-WC-TKN_AutoPhenate, Rev.0	0	11/28/12	Total Nitrogen by the Kjeldahl Method by AutoPhenate Method (TKN)	SOP
Wet Chemistry	UP-WC-N3N2_AQ2, Rev.6	6	09/28/12	Nitrate/Nitrite by Cadmium Reduction by AQ2 Seal	SOP
Wet Chemistry	UP-WC-N3N2_Systea, Rev.0	0	11/28/12	Nitrate/Nitrite, Systea_Reagent1	SOP
Wet Chemistry	UP-WC-Nitrite,Rev.17	17	02/28/13	Nitrite	SOP
Wet Chemistry	UP-WC-DO,Rev.14	14	11/28/12	Dissolved Oxygen	SOP
Wet Chemistry	UP-WC-Phosphorus, Rev.15	15	12/19/12	Phosphorus and Ortho-Phosphorus	SOP
Wet Chemistry	UP-WC-SO4,Rev.16	16	02/28/13	Sulfate	SOP
Wet Chemistry	UP-WC-Sulfide,Rev.17	17	11/26/12	Sulfide, Total Acid Soluble, Acid-Volatile and Reactive	SOP
Wet Chemistry	UP-WC-BOD, Rev.20	20	09/13/13	Biochemical Oxygen Demand (BOD) & Carbonaceous BOD (CBOD)	SOP
Wet Chemistry	UP-WC-TOC,Rev.14	14	11/16/12	Total Organic Carbon / Total Inorganic (Diss) Carbon	SOP
Wet Chemistry	UP-WC-Phenol_AQ2,Rev.16	16	07/03/13	Phenolics by AQ2 Seal	SOP
Wet Chemistry	UP-WC-1664,Rev.13	13	12/07/12	Oil & Grease / Total Recoverable Hydrocarbons (HEM / SGT-HEM)	SOP
Wet Chemistry	UP-WC-9013,Rev.07	7	10/19/12	Cyanide - Pre-Extraction Procedure	SOP
Wet Chemistry	UP-WC-9020B,Rev.14	14	10/31/12	Total Organic Halogen (Mitsubishi)	SOP
Wet Chemistry	UP-WC-9095,Rev.15	15	09/28/12	Paint Filter	SOP
Wet Chemistry	UP-WC-COD,Rev.16	16	08/30/13	Chemical Oxygen Demand (COD)	SOP
Wet Chemistry	UP-WC-002,Rev.14	14	01/16/13	TOC/TIC by Lloyd Kahn (Soils)	SOP
Wet Chemistry	UP-WC-Redox,Rev.05	5	08/30/13	Oxidation-Reduction Potential - ORP	SOP
Wet Chemistry	UP-WC-Turbidity,Rev.00	0	Pending	Turbidity	SOP
Waste Management	UP-WM-001,Rev.18	18	07/31/13	Laboratory Waste Disposal Procedures	SOP
Waste Management	UP-WM-002, Rev.12	12	08/16/13	Waste Minimization	SOP
Waste Management	UP-WM-003, Rev.05	5	10/19/12	USDA Regulated Foreign Soil & Quarantine Domestic Soil Record	SOP



# Certification Summary

Client: URS Corporation  
Project/Site: BP Whiting - J&L Site Investigation

TestAmerica Job ID: 500-62022-1

## Laboratory: TestAmerica Chicago

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40461	04-30-14
California	NELAP	9	01132CA	04-30-14
Georgia	State Program	4	N/A	04-30-14
Hawaii	State Program	9	N/A	04-30-14
Illinois	NELAP	5	100201	04-30-14
Indiana	State Program	5	C-IL-02	04-30-14
Iowa	State Program	7	82	05-01-14
Kansas	NELAP	7	E-10161	10-31-13
Kentucky	State Program	4	90023	12-31-13
Kentucky (UST)	State Program	4	66	04-30-14
Louisiana	NELAP	6	30720	06-30-14
Massachusetts	State Program	1	M-IL035	06-30-14
Mississippi	State Program	4	N/A	04-30-14
North Carolina DENR	State Program	4	291	12-31-13
North Dakota	State Program	8	R-194	04-30-14
Oklahoma	State Program	6	8908	08-31-14
South Carolina	State Program	4	77001	09-30-13 *
Texas	NELAP	6	T104704252-09-TX	02-28-14
USDA	Federal		P330-12-00038	02-06-15
Wisconsin	State Program	5	999580010	08-31-14
Wyoming	State Program	8	8TMS-Q	04-30-14

\* Expired certification is currently pending renewal and is considered valid.

**Appendix 9b – Benzene Waste NESHAP Laboratory Audit  
Reporting**

**AIR SAMPLE ANALYSIS FOR BENZENE  
LABORATORY AUDIT REPORT  
TEST AMERICA – SACRAMENTO, CALIFORNIA**

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**Prepared by:**

Steve Freeman  
Principal Consultant

**TRINITY CONSULTANTS**

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(319) 706-8537

October 1, 2013

**Project Number: 131401.0129**



# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

## **TABLE OF CONTENTS**

---

<b>1. INTRODUCTION .....</b>	<b>2</b>
<b>2. LABORATORY AUDIT METHOD .....</b>	<b>3</b>
<b>3. AUDIT RESULTS .....</b>	<b>5</b>
<b>4. AUDIT AREA OF CONCERN .....</b>	<b>8</b>
<b>5. AUDIT RECOMMENDATIONS FOR IMPROVEMENT.....</b>	<b>9</b>
<b>6. ATTACHMENTS.....</b>	<b>10</b>

# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

## **1. INTRODUCTION**

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The BP – Whiting Business Unit (BP) requested that Trinity Consultants (Trinity) perform an Air Sample Analysis for Benzene Laboratory Audit at the Test America facility in Sacramento, California. Lead Auditor, Steve Freeman of Trinity completed the audit in accordance with Proposal number 131401.0129 on September 19, 2013. Pursuant to consent decree, section 19.H, Trinity reviewed all of the analytical areas and methods of the laboratory associated with air sample analysis for benzene by the following EPA methods:

1. Determination of Volatile Organic Compounds (VOCs) In Ambient Air Using Specially Prepared Canisters With Subsequent Analysis by Gas Chromatography (TO-14A)
2. Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS) (TO-15)

Trinity conducted the audit according to the agreed upon scope of work including but not limited to the following:

- Size, cleanliness, and organization of the laboratory;
- Sample canister preparation areas, sample receiving, storage and log-in procedures;
- Quantity, age, availability, scheduled maintenance and performance of the instrumentation;
- Availability, appropriateness, and utilization of the Quality Assurance Plan (QAP) and Standard Operating Procedures (SOPs);
- Staff qualifications/experience and personnel training programs;
- Results of performance evaluation (PE) samples (as conducted for state or national certification programs);
- Reagents, standards, and sample storage facilities;
- Standards preparation, preparation logbooks, and raw data;
- Bench sheets and analytical logbook maintenance and review; and
- Review of the sample analysis/data package inspections and data management procedures.

This report provides an overview of the Air Sample Analysis for Benzene Laboratory Audit conducted at the Test America, Sacramento, California facility.

# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

## **2. LABORATORY AUDIT METHOD**

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Prior to the laboratory audit, the Test America management were asked to complete a pre-audit questionnaire provided by BP. Trinity also requested the following documentation for review:

- Laboratory Organization Chart
- Quality Assurance Plan/Manual
- Standard Operating Procedures - listing of the standard operating procedures
- Health & Safety Plan/Chemical Hygiene Plan
- Laboratory Certifications
- Performance Evaluation Studies

Ms. Karla Buechler, the Laboratory QAM/Technical Director, provided the requested documentation including the completed pre-audit questionnaire. Trinity reviewed all the documentation and prepared an audit agenda for the day. This documentation is provided as attachments to this audit report.

At the start of the on-site audit Trinity conducted an opening meeting with Test America to discuss the audit methodology, the agenda and any logistical considerations necessary to ensure a complete and comprehensive audit. Trinity next toured the facility with Ms. Karla Buechler acting as escort. The laboratory is a well-equipped environmental lab doing multiple different analyses with an emphasis on water analysis. There is one main building of approximately 66,000 sq. ft. with approximately 44,000 sq. ft. devoted to laboratories. The facility employs 67 employees including 45 laboratory staff. Test America recently closed its laboratory in Costa Mesa, California with the Sacramento laboratory absorbing the bulk of the work. As a result the Sacramento laboratory was busy and was also in the process of expanding its variety of laboratory analysis methods performed. Air sample analysis is relatively new to the Sacramento laboratory as a result with less than 1 year experience on performing this work. During the audit Trinity met with and interviewed a sampling of the Laboratory Technicians, Supervisors, Laboratory Operations Management, Project Managers and Facility Management. Trinity audited the following laboratory operations:

- Sample canister preparation, shipping and sample receipt
- Sample handling and storage
- Analytical laboratories with emphasis on volatiles analysis
- Waste disposal storage areas

# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

- Water purification systems
- Quality assurance program and project management
- Data and Report review and preparation
- Data management and storage
- Record retention areas

In addition, the following were audited to determine if the laboratory programs and methods were adequate and effective:

- Personnel including their qualifications, education and training
- Methods of sample canister identification, preparation and shipment
- Methods of sample receipt, identification, logging and refrigerated storage
- Lab sample tracking and preparation
- Sample analysis methods including equipment calibration and maintenance
- Test method adherence to standard methods
- Consistency of results by varying technicians and equipment setups
- Management of analytical results and data reporting
- Project management including report writing
- Quality assurance program including multiple reviews of reports
- Internal and external audit programs
- Laboratory certifications to NELAC

# AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT

Test America – Sacramento, California

## 3. AUDIT RESULTS

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**Sample Canister Area:** The sample canister preparation and shipping area was well organized and clean. All sample canisters are evacuated, cleaned and purged with ultra-high purity liquid nitrogen, pressure and vacuum checked and internally certified by GC/MS checks prior to shipment. Any canisters that fail to meet appropriate vacuum and pressure checks are replaced or repaired and retested. Any canisters that fail checks after evacuation and cleaning are sent back for re-evacuation and re-cleaning until they successfully pass the certification standards. Canisters are prepared and cleaned in both individual and batch modes. After cleaning, individual canisters are 100% checked for contamination. Batched canisters are pre-checked for contamination. After cleaning, the worst canister from the batch is then fully checked for contaminants. If it passes then all canisters in that batch are certified. If the worst canister fails the check, all the canisters in the batch are fully checked. Auditing of the batched canisters is also used to ensure that all canisters meet the certification requirements. Blank Chain of Custody forms are shipped with the canisters for the clients to fill out and return. Each canister is bar code labelled for traceability.

**Sample Receipt Area:** The sample receipt area is well organized and clean. All samples are received during normal business hours which are extended as needed to accommodate clients. All samples are checked for sample and canister identification, integrity, pressure, Chain of Custody, custody seals, hold times and logged into the lab LIMS software system. Samples are received in both canisters and sealed plastic bags. Upon receipt the samples in the plastic bags are transferred into empty certified canisters. All samples go to the Volatiles Laboratory in canisters for analysis after being logged in. Any issues are noted in the LIMS system and discussed with the Project Managers and the client.

**Laboratories:** Analysis laboratories were in good condition, neat and organized. Technicians are notified of samples needing analysis through a daily backlog report which also tracks sample identification and hold times. Each sample has its own unique bar code label that matches the barcodes on the backlog report. The Volatiles Laboratory is maintained with a positive air pressure to avoid cross contamination from other labs. Personnel access is limited and controlled. Samples are analyzed using accepted methodologies. GC/MS instrumentation is used for air sample analysis for benzene using method TO-14A and TO 15. All equipment is calibrated according to established standards. All chemicals used in the analysis are reagent grade and within allowed expiration dates. Water used is purified using a deionizer followed by an ultra-filtration system. Samples are prescreened to determine appropriate dilution levels and rerun if the dilution is not correct.

# AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT

Test America – Sacramento, California

Method blanks and standards are inserted into the analysis sequence to check for any cross contamination or carry over issues. Auto-samplers run the samples in sequence with the run sheets and computer tracking. Samples, standards and surrogates are maintained in refrigerated storage, within hold times and expiration dates. All equipment is well maintained and calibrated at the appropriate frequency. Any deviations, repairs or adjustments due to maintenance are recorded in logbooks and approved by supervisory personnel. Any deviations from normal procedure are noted in the records and discussed with the Project Managers for consultation with the clients.

**Waste Management:** Samples are retained for 30 days prior to disposal. Waste is appropriately identified, handled and stored. Hazardous waste is segregated and stored in a 90 day storage area within the building. Test America Sacramento Laboratory is a Large Quantity Generator of hazardous waste. No problems were observed with the process of hazardous and non-hazardous waste disposal.

**Data and Record Management:** All data is managed through the LIMS system. Analytical results are first reviewed by the technician doing the work. A second review occurs by the lab supervision. Records of these reviews are maintained within the LIMS system. After these reviews are completed the data is sent to the Project Manager for the report writing. The Project Manager also completes a final review of the data. The QA/QC Manager completes additional report reviews on a sampling basis. All data on the computer system is stored multiple times daily on the Test America Corporate Headquarters servers in Denver, Colorado. All information is backed up once a day at the Test America facility in Houston, Texas. Hard copy records are not being kept. All data is stored within the Computer systems.

**Documentation:** Standard Operating Procedures and Manuals were up to date, available and had current revision numbers.

**Accreditation:** The Test America Sacramento Laboratory has multiple Accreditations for multiple purposes. NELAC Accreditations appropriate to the air sample analysis for benzene by methods TO-14A and TO-15 were current with the state of Louisiana directly and with Florida, Texas, Utah and Washington through reciprocity. On the other hand, the Test America Sacramento Laboratory is not currently accredited for air sample analysis for benzene with California nor Indiana. (See Area for Concern below)

**Health and Safety:** Commitment to health and safety was good. The Chemical Hygiene Plan defines the laboratory program. Observations indicate the health and safety regulations were being followed. Technicians were wearing appropriate safety glasses, lab coats, and using chemical resistant gloves. Eye wash/deluge shower stations and fire extinguishers were

# AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT

Test America – Sacramento, California

easily accessible and being inspected properly. Exits were not blocked and were properly marked. Compressed gas cylinders were secured.

**Training:** Personnel were properly qualified, well trained and very knowledgeable. Records of training and evaluations were up to date and complete. Demonstration of Capability certificates were issued and current with one exception.

**Security:** A perimeter security system monitors the building on a 24 hour, 7 day basis with appropriate alerts going to Test America personnel. All exterior doors and windows were being maintained closed and locked from the outside except for the sample receiving door during normal business hours. This area has Test America personnel present at all times that the doors are unlocked and there is only locked access beyond the immediate area of this one small receiving room.

**Conclusions:** The laboratory was well run and performing analysis in an effective manner. One significant issue was observed and is shown as the one area of concern for the audit below. In addition, three recommendations for improvement were noted.

# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

## **4. AUDIT AREA OF CONCERN**

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### **Area of Concern:**

1. The Test America Sacramento Laboratory is accredited to NELAC standards by the state of Louisiana for air sample analysis for benzene by EPA methods TO-14A and TO-15. They are also accredited for these same methods by the states of Florida, Texas, Utah and Washington by reciprocity with Louisiana. On the other hand, they are not accredited by either the States of California (where the lab is located) nor by the State of Indiana (where the BP – Whiting Business Unit is located.) The Test America Sacramento Laboratory began doing these air analyses this year. The statement was made that they could not obtain the California accreditation due to the short time they have doing this work but should have it in the near future.

# AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT

Test America – Sacramento, California

## 5. AUDIT RECOMMENDATIONS FOR IMPROVEMENT

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### Recommendations for Improvement:

1. Canisters that have been cleaned but fail the internal certification checks are listed in the laboratory's TALS software system as "A" status for "acceptable" despite the need for additional cleaning. The canisters are also shown as "batched" and lack a second level review at this point which prevents them from being sent to a client for use. It is recommended to reconsider if listing these canisters as "A" status is appropriate when other codes are available in TALS (such as "rejected") for these unsuccessfully cleaned canisters. Further, although scheduled, an internal audit has not yet occurred of the canister cleaning process. It is recommended to conduct this internal audit including the adequacy of controls on insufficiently cleaned canisters.
2. Received canisters containing client samples are placed on shelves of rolling industrial racks in the Sample Receipt Area and transferred to the Volatiles Laboratory for analysis. Each rack shelf has a lip to prevent the canisters from falling off the rack. It was observed that some of these canisters were significantly overhanging and on top of the shelf lip edges. When the canisters are placed on top of the shelf lip they are at greater risk of falling off the rack when bumped or moved. It is recommended to only place the canisters flat on the rack shelves, for rack movement and storage.
3. One Laboratory Technician that conducts GC/MS analyses of air samples had completed all necessary training and qualification tests; however, the Demonstration of Capability certificate has not yet been issued for the Technician.

Sincerely,

TRINITY CONSULTANTS

Steve Freeman  
Principal Consultant & EH&S Audit Business Line Manager

# **AIR SAMPLE ANALYSIS FOR BENZENE LABORATORY AUDIT REPORT**

**Test America – Sacramento, California**

## **6. ATTACHMENTS**

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Attachments:

- a. Audit Checklist
- b. Pre-audit checklist
- c. Corporate Safety Manual – Table of Contents
- d. Quality Assurance Manual - Table of Contents
- e. Standard Operating Procedure List
- f. Lab Certifications

**LABORATORY AUDIT  
BENZENE WASTE NESHAP, PURSUANT TO CONSENT  
DECREE, SECTION 19.H.**

**BP**

**PREPARED FOR USEPA**

**LABORATORY AUDIT CHECKLIST**

## Table of Contents

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1.0	General Information .....	2
2.0	Data Management Checklist .....	6
3.0	Effectiveness of QA Program .....	7
4.0	Additional Notes .....	8
5.0	Exit Interview Worksheet .....	9

# BENZENE NESHAP LABORATORY AUDIT CHECKLIST

## 1.0 GENERAL INFORMATION

Item	
Laboratory:	Test America Inc.
Address:	880 Riverside Parkway, West Sacramento, California 95605
Phone No.	(916) 373-5600
Date Audited:	September 19, 2013
Auditor(s):	Steve Freeman, Trinity Consultants
Number of Personnel:	67
Certifications:	Louisiana (Primary); Florida, Texas, Utah, Washington (secondary)-NELAC Air samples benzene (Note: No accreditation for California or Indiana)
Business/Operating Hours:	8:00 am to 5:00 pm Monday thru Friday (limited 2 <sup>nd</sup> & 3 <sup>rd</sup> shift as needed)
Square Footage:	66,000 – 44,000 in laboratories
Year Founded/Years in Current Location:	1978/19 years in current location – Air sample analysis less than 1 year

## 1.1 Organization and Personnel

Item	Yes	No	Comment(s)
Is the organization adequately staffed to meet commitments to BP on a timely manner?	Y		
Is the organization structure sufficient for BP NESHAP work to be performed?	Y		Audit was limited to air sample analysis for benzene
Is there enough emphasis place on proper health & safety and chemical hygiene practices?	Y		
Do personnel assigned to NESHAP-related work have the appropriate credentials and experience to successfully accomplish the BP's data quality objectives?	Y		
Is training properly documented and records are adequate to attest to personnel expertise at NESHAP analysis?		N	Demonstration of Capability certificate for one technician was not yet issued. All test completed

## 1.2 General Laboratory Facilities

Item	Yes	No	Comment(s)
Does the laboratory have a security system to protect the premises from intruders and appropriate sign-in/sign-out procedures?	Y		
Are all of the laboratory areas maintained in a clean and organized manner?	Y		
Do all laboratory personnel appear to have adequate workspace?	Y		
Are health and safety and chemical hygiene training and	Y		

Item	Yes	No	Comment(s)
practices adequate and documented throughout the laboratory and are they in accordance with the H&S Plan and CHP?			
Are the laboratory's practices for waste storage, sample waste, and bottle storage and disposal adequate and in accordance with regulations and laboratory SOPs?	Y		
Does the laboratory have an adequate supply of and conduct proper monitoring of the deionized water?	Y		
Are annual ventilation checks and environmental monitoring documented?	Y		
Does the laboratory have sample storage areas of adequate size, that is maintained and monitored to minimize contaminants?	Y		
Are the volatiles laboratories sufficiently ventilated to minimize background contaminants?	Y		

### 1.3 Sample Receipt and Storage Area

Item	Yes	No	Comment(s)
Is there a designated sample custodian? If yes, name of sample custodian. Name: Karla Buechler, Gary Costley _____	Y		
Are written Standard Operating Procedures (SOPs) available for the receipt and storage of samples?	Y		
Does the SOP adequately cover receipt and storage activities?	Y		
Are custody and sample integrity issues adequately addressed and documented for receipt and storage activities?		N	Received air sample canisters overhang rack edges and could fall off racks during transfer to volatile lab
Does the laboratory adequately assess and document sample preservation (temperature and acid preservation)?	Y		
Are the measurement devices adequately calibrated?	Y		
Are cold storage units adequately maintained and monitored for possible contaminants?	Y		Generally n/a
Is the laboratory LIMS adequate to document the location, condition and integrity of samples?	Y		
Are all sample receiving and documentation records adequately maintained?	Y		
Do worksheets/logbooks indicate periodic supervisory review?	Y		
Are corrective actions (when necessary) clearly documented?	Y		
Are there any evident health and safety issues in the receipt and/or storage areas?	Y		

Item	Yes	No	Comment(s)
Is the receipt of rush samples adequately communicated within the laboratory?	Y		
Are all activities and documentation aspects of sample receiving and storage adequate for BP samples?	Y		

#### 1.4 Sampling Vessels/Containers

Item	Yes	No	Comment(s)
Does the laboratory have SOPs for the preparation of sampling vessels/containers?	Y		
If yes above, does the laboratory follow the SOPs?	Y		
Does the laboratory appear to have an adequate supply of sampling vessels/containers?	Y		
Does the laboratory reuse the sampling vessels/containers?	Y		
Does the laboratory lot check the cleanliness of their sampling vessels/containers?	Y		100% checks on request Cleaned vessels are labelled "A" for acceptable even if they fail the check for the cleaning process but are held from reuse by other means until recleaned
Does the laboratory ship the sampling vessels/containers under formal Chain-of-Custody and with custody seals?		N	Blank Chain of Custody and Custody Seals provided Yes on request
Does the laboratory provide Trip Blanks?	Y		
Are all vessels/containers, preservatives, reagents, etc. completely traceable?	Y		
Are all sampling vessels/containers properly labeled?	Y		

#### 1.5 Benzene by GC and GC/MS

Item	Yes	No	Comment(s)
Does the laboratory reference the proper methods for the sample analyses?	Y		EPA Method TO 14A & TO 15
Does the laboratory have instrumentation dedicated to volatile analysis in a separate climate- and pressure-controlled room dedicated only to volatile organics analysis?	Y		
Does the instrumentation use voltage control devices and have acceptable maintenance (preventive and service) programs and appropriate documentation (operating manuals, logbooks)?	Y		

Item	Yes	No	Comment(s)
Are the volatile samples are appropriately stored in a separate refrigerator and are temperature logs kept that includes all appropriate information?	Y		Generally n/a
Does the laboratory initiate, analyze, and document results for holding blanks at the appropriate frequency?	Y		
Are volatile standards appropriately prepared, labeled, stored, documented, and traced?	Y		
Are the current/updated SOPs readily available to the analysts?	Y		
Does the laboratory have current MDLs available for all methods and all instruments?	Y		
How and when are aqueous samples pH measurements are taken (if applicable)?	Y		pH checks completed with the GCMS analysis
How do analysts keep track of samples so holding times are not missed?	Y		Backlog reports
Are the frequency, concentration, criteria, and corrective action for the GC/MS tune check appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the initial calibration and calibration checks appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the QC samples and measures (method blanks, MS/MSD, LCS, surrogates, internal standards) appropriate?	Y		
Is the procedure for establishing and updating RT windows acceptable?	Y		
For the GC analyses, are all positive results confirmed on a second dissimilar GC column?	Y		
Does the laboratory perform dilutions if any analyte is over calibration range (if applicable)?	Y		
Does the laboratory quantitate samples from the initial calibration?	Y		
Does the laboratory document manual integrations?	Y		
Does the laboratory monitor for carryover?	Y		
Are magnetic tapes/DAT/CDs stored in a secure place?	Y		
Do supervisory personnel review the data and sign-off on QC results and analyst logbooks?	Y		.

## 2.0 DATA MANAGEMENT CHECKLIST

### 2.1 Sample Tracking

Item	Yes	No	Comment(s)
Is computer hardware consistent with questionnaire?	Y		
Is there an adequate sample tracking system in place?	Y		
Is there a warning system for holding time expirations?	Y		

### 2.2 Data Reporting

Item	Yes	No	Comment(s)
What software is used in report generation?	Y		LIMS. TALS
What types of QC reports are available?	Y		Level 1 thru Level 4 complete document packages
Does the laboratory have a dedicated data package preparation staff?	Y		
How are final reports proofed against input data?	Y		Project Manager
Are data calculations checked?	Y		
Does either the analyst or a QC reviewer check and sign reports?	Y		
How are anomalies/problems noted, tracked and reported?	Y		Noted in LIMS – reported to client

### 2.3 Data Archive

Item	Yes	No	Comment(s)
Describe the system backups, including type, frequency, tape rotation, and tape storage.	Y		Backup on Denver HQ servers multiple times daily and at Houston offsite server daily
Where is data archived and is it under limited access?	Y		Denver HQ and Houston Offsite servers
How long is retained?	Y		5 years storage of tapes minimum
How is hardcopy data archived by type and how long is retained for (on-site and off-site?)	Y		No current hardcopies are kept. All data and reports are on the computer systems

### 3.0 EFFECTIVENESS OF QA PROGRAM

Item	Yes	No	Comment(s)
Does the laboratory maintain a dedicated QA group? What percentage of the data does the QA group review?	Y		50-60% of analysis.
Does the laboratory participate in external audit programs?	Y		annual
Does the laboratory have a regularly scheduled internal QA program (including internal audits)? If so, how frequently?	Y		
Does the staff have access to a copy of the facility's Quality Assurance Plan (QAP)?	Y		
Are Data Quality Objectives documented in written form?	Y		
Does the QAP address all necessary elements necessary to generate high-quality data?	Y		
Is there a formal staff training program and are training files adequately maintained?	Y		

## 4.0 ADDITIONAL NOTES

[illegible]

## 5.0 EXIT INTERVIEW WORKSHEETS

### 5.1 Evaluation Form

Laboratory Facility: Test America – Sacramento, California\_\_\_\_\_

Date: September 20, 2013\_\_\_\_\_ Prepared by: Steve Freeman, Trinity Consultants\_\_\_\_\_

	1	2	3	Comment
<b>1.0 GENERAL INFORMATION</b>				
1.1 – Organization and Personnel		X		One technician did not have an issued Demonstration of Capability
1.2 – General Laboratory Facilities	X			
1.3 – Sample Receipt and Storage		X		Received air sample canisters overhang rolling industrial rack edges and could fall off racks during transfer to volatile lab
1.4 – Sampling Vessels/Containers	X			
1.5 – Benzene by GC and GC/MS	X			
<b>2.0 DATA MANAGEMENT CHECKLIST</b>				
2.1 - Sample Tracking	X			
2.2 – Data Reporting	X			
2.3 – Data Archive	X			
<b>3.0 Effectiveness of QA Program</b>	X			

1 – Acceptable, no deficiencies identified

2 – Adequate. Some minor deficiencies were identified that require corrective action

3 - Not Acceptable. Significant major and minor deficiencies were identified. All such items should be discussed with laboratory management and corrective actions agreed upon and noted.

### 5.3 Audit Team Signatures



September 20, 2013

Auditor \_\_\_\_\_ Date \_\_\_\_\_ Auditor \_\_\_\_\_ Date \_\_\_\_\_

Auditor \_\_\_\_\_ Date \_\_\_\_\_

### 5.4 Audit Report Process

A draft audit report is issued to the laboratory for their comment/correction within 2 weeks of the audit (within 48 hours if significant/critical issues are identified). Once finalized, the laboratory has one week to respond and issue a formal corrective action memorandum to the Audit Team Members.

**LABORATORY AUDIT  
BENZENE WASTE NESHAP, PURSUANT TO CONSENT  
DECREE, SECTION 19.H.**

**BP**

**PREPARED FOR USEPA**

**LABORATORY PRE-AUDIT QUESTIONNAIRE**

## Pre-Audit Questionnaire

---

<b>1.0</b>	<b>Organization and Personnel.....</b>	<b>2</b>
<b>2.0</b>	<b>Analytical Instrumentation .....</b>	<b>4</b>
<b>3.0</b>	<b>Calibration Materials .....</b>	<b>5</b>
<b>4.0</b>	<b>LIMS .....</b>	<b>6</b>
<b>5.0</b>	<b>Data Reduction/Reporting .....</b>	<b>7</b>
<b>6.0</b>	<b>Laboratory Documentation.....</b>	<b>8</b>

**1.0 ORGANIZATION AND PERSONNEL**

<b>ITEM</b>	
Laboratory Name:	
Address:	
Phone No.	
Contact Name	
Number of Personnel:	
Certifications:	
Business/Operating Hours:	
Square Footage:	
Year Founded/Years in Current Location:	
<b>Laboratory Manager/Director</b> (individual responsible for overall technical effort)	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>GC/MS Volatiles - Laboratory Supervisor</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>GC/MS Volatiles (NESHAP) - Analyst</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>GC Volatiles - Laboratory Supervisor</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>GC Volatiles (NESHAP) - Analyst</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>QA Officer/Director</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>Laboratory Project Manager</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____
<b>Health &amp; Safety Director</b>	
Name: _____	
Degree(s): _____	Years of Direct Experience: _____

## Pre-Audit Questionnaire

ITEM
Item
Will the Quality Assurance Officer be available during the onsite audit? _____ Name: _____
Will the Project Manager be available during the evaluation? _____ Name: _____
Please attach the most recent laboratory organization chart. If there have been changes, please make to appropriate notations <i>Additional Comments:</i> _____

**2.0 ANALYTICAL INSTRUMENTATION****2.1 GC and GC/MS Instrumentation utilized for NESHAP projects\***

Instrument	Manufacturer	Model/ Revision	Installation Date	GC Column(s)	Analyses Performed
GC ID No.					
GC ID No.					
GC MS ID No.					
GC MS ID No.					

\* A complete list of all analytical instrumentation containing the same information as this questionnaire can substitute for completion of this section.

ITEM
Are manufacturer's operating manuals readily available to the operators? _____
Is instrument service and maintenance performed under service contracts? _____
How is maintenance documented? _____
Please describe your lab's internal preventative maintenance program: _____ _____ _____ _____ _____

**3.0 CALIBRATION MATERIALS**

Test	Source of Standard(s)*	Source of Reference Samples**
Benzene		
Benzene		

\*Standard materials used to prepare calibration standards.

\*\*Reference samples (viz., second source) supplied to verify external accuracy.

ITEM
How long are intermediate and working benzene NESHAP standards held for (as the default)? _____
Are all benzene NESHAP standards and spike solutions completely traceable from labeling, preparation logbooks and Certificates of Analysis and available for inspection? _____
Please describe how your laboratory assures that expired reference materials are not used and how often refrigerators/freezers are cleaned out and expired materials removed: _____ _____ _____ _____ _____

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#### 4.0 LABORATORY INFORMATION MANAGEMENT SYSTEMS (LIMS)

ITEM
Provide a brief overview of the LIMS (Make/Platform, etc.)
Are GCs and GC/MSs to be used for benzene NESHAP work directly linked to LIMS?
Provide a complete list of functions that the LIMS provides:

**5.0 DATA REDUCTION/REPORTING**

ITEM
What software packages are used in data processing, reduction and reporting?
_____
_____
_____
Does the lab have versatile capabilities to generate EDDs? List the formats available
_____
_____
_____
_____

**6.0 LABORATORY DOCUMENTATION**

**6.1 Quality Assurance Plan/Manual**

Please provide a copy of the Table of Contents for the laboratory's QA Plan/Manual.

**6.2 Standard Operating Procedures**

Please provide a complete indexed listing of the laboratory's standard operating procedures (include revision numbers and effective dates).

**6.3 Health & Safety Plan/Chemical Hygiene Plan**

Please provide a copy of the Table of Contents for the laboratory's Health & Safety Plan and Chemical Hygiene Plan.

**6.4 Laboratory Certifications**

Please provide a complete list the laboratory certifications.

**6.5 Performance Evaluation Studies**

Please provide a complete copy of the results of laboratory's most recent USEPA performance evaluation studies and any other pertinent performance evaluation studies available for review during the on-site inspection.

The TestAmerica Corporate Environmental, Health and Safety Manual (EH&S) is applicable to the TestAmerica Laboratories, Inc.; EMLab P&K; QED Environmental Systems, Inc.. Due to the nature of their business, METCO's EH&S Manual is under separate cover.

The Corporate manual is reviewed on an annual basis. Each section is independently revised. Facility/Laboratory Directors and EH&S Coordinators are responsible for replacing the updated sections of their manuals with the most recent revisions. The latest revision dates for each section are listed in the table below.

Section Number	Title	Effective Date
1	Policy, Scope and Purpose	11/30/2012
2	Responsibilities	11/30/2012
3	General Principles for Work with Hazardous Chemicals	11/30/2012
4	Training Requirements	11/30/2012
5	Hazard Communication Programs	11/30/2012
6	Facility Requirements	11/30/2012
7	Procedures for Responding to Emergencies	11/30/2012
8	Personal Protective Equipment (PPE) and Apparel	11/30/2012
9	Basic Rules and Procedures	11/30/2012
10	Use of Hazardous Materials	11/30/2012
11	Systems Under Pressure or Vacuum	11/30/2012
12	Inspections and Equipments Tests	11/30/2012
13	Waste Management & Pollution Prevention	11/30/2012
14	Transportation and Fleet Safety Program	11/30/2012
15	Office Safety/Ergonomics in the Work Place	11/30/2012
16	Microbiological Testing Laboratories	11/30/2012
17	Field Safety	11/30/2012
18	Radioactive Samples and Materials	11/30/2012
19	Bloodborne Pathogen Program for Field Personnel and Employees That Could Work with Bloodborne Pathogens	11/30/2012
Appendix I	State of California Requirements	11/30/2012
Appendix II	References	11/30/2012
Appendix III	MSDS Components	11/30/2012
Appendix IV	NFPA Rating System	11/30/2012
Appendix V	Use of Toxicity Data	11/30/2012

Section Number	Title	Effective Date
Appendix VI	Incompatible Chemicals	11/30/2012
Appendix VII	List of EH&S Forms <sup>1</sup>	11/30/2012
Appendix VIII	Procedures for Preparing Safety Analysis for Work Areas	11/30/2012
Appendix IX	Guidance for Employees on Investigating Incidents	11/30/2012
Appendix X	Confined Space Entry Policy	11/30/2012
Appendix XI	Methylene Chloride Compliance Program	11/30/2012
Appendix XII	TestAmerica Laboratories, Inc. Carcinogen List	11/30/2012
Appendix XIII	List of Acronyms	11/30/2012

<sup>1</sup> EH&S Forms are available on the Company's Intranet (Oasis / EH&S).

## SECTION 2. TABLE OF CONTENTS

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
1.0	Cover Page and Signatures	V1M2 Sec. 4.2.8.3		1
2.0	TABLE OF CONTENTS	V1M2 Secs. 4.2.8.3-4.2.8.4		2
3.0	INTRODUCTION, SCOPE AND APPLICABILITY	V1M2 Sec. 4.2.8.4		12
3.1	Introduction And Compliance References	V1M2 Secs. 1.1; 1.2; 2.0; 3.2; 4.1.2; 4.2.4	4.1.2; 4.2.4	12
3.2	Terms And Definitions	V1M2 Secs. 3.0; 4.2.4	4.2.4	13
3.3	Scope / Fields Of Testing	V1M2 Secs. 1.2; 4.2.4	4.1.2; 4.2.4	13
3.4	Management Of The Manual	V1M2 Secs. 4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	14
4.0	MANAGEMENT REQUIREMENTS	V1M2 Sec. 4		15
4.1	Overview	V1M2 Secs. 4.1.1, 4.1.3; 4.1.5	4.1.1; 4.1.3; 4.1.5; 4.2.6	15
4.1	Roles And Responsibilities	V1M2 Secs. 4.1.4; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	4.1.3; 4.1.5; 4.1.6; 4.2.1; 4.2.6; 5.2.4	15
4.3	Deputies	V1M2 Secs. 4.1.5; 4.1.7.2; 4.2.7	4.1.5; 4.2.7	17
5.0	QUALITY SYSTEM			22
5.1	Quality Policy Statement	V1M2 Secs. 4.1.5; 4.2.2; 4.2.3; 4.2.8.3	4.1.5; 4.2.2; 4.2.3	22
5.2	Ethics And Data Integrity	V1M2 Secs. 4.1.5; 4.1.6; 4.2.2; 4.2.8.1; 5.2.7	4.1.5; 4.2.2	22
5.3	Quality System Documentation	V1M2 Secs. 4.1.5; 4.2.2; 4.2.5	4.2.2; 4.2.5	23
5.4	QA/QC Objectives For The Measurement Of Data	V1M2 Sec. 4.2.2	4.1.5; 4.2.2	24
5.5	Criteria For Quality Indicators			26
5.6	Statistical Quality Control			26
5.7	Quality System Metrics			27
6.0	DOCUMENT CONTROL	V1M2 Secs. 4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	28
6.1	Overview			28
6.2	Document Approval And Issue	V1M2 Secs. 4.3.2; 4.3.2.1-4.3.2.3; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.2.3; 4.3.3.1	28
6.3	Procedures For Document Control Policy	V1M2 Secs. 4.3.2.1-4.3.2.2; 4.3.3.1	4.3.2.1; 4.3.2.2; 4.3.3.1	29

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
6.4	Obsolete Documents	V1M2 Secs. 4.3.2.1–4.3.2.2	4.3.2.1; 4.3.2.2	29
7.0	SERVICE TO THE CLIENT	V1M2 Secs. 4.4.1 - 4.4.4	4.4.1; 4.4.2; 4.4.3; 4.4.4	30
7.1	Overview	V1M2 Secs. 4.4.5; 4.5.5; 5.7.1	4.4.5; 5.7.1	30
7.2	Review Sequence And Key Personnel	V1M2 Sec. 4.4.5	4.4.5	31
7.3	Documentation	V1M2 Sec. 5.7.1	5.7.1	32
7.4	Special Services	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	33
7.5	Client Communication	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	33
7.6	Reporting	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	33
7.7	Client Surveys	V1M2 Secs. 4.7.1-4.7.2	4.7.1; 4.7.2	34
8.0	SUBCONTRACTING OF TESTS	V1M2 Secs. 4.4.3; 4.5.4	4.4.3; 4.5.4	35
8.1	Overview	V1M2 Secs. 4.5.1 - 4.5.3; 4.5.5; 5.3.1	4.5.1; 4.5.2; 4.5.3; 5.3.1	35
8.2	Qualifying And Monitoring Subcontracators	V1M2 Secs. 4.5.1; 4.5.2; 4.5.3; 4.5.5	4.5.1; 4.5.2; 4.5.3	35
8.3	Oversight And Reporting	V1M2 Sec. 4.5.5		37
8.4	Contingency Planning			38
9.0	PURCHASING SERVICES AND SUPPLIES	V1M2 Sec. 4.6.1	4.6.1	41
9.1	Overview	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4	4.6.2; 4.6.3; 4.6.4	41
9.2	Glassware	V1M2 Sec. 5.5.13.1		41
9.3	Reagents, Standards & Supplies	V1M2 Secs. 4.6.2; 4.6.3; 4.6.4	4.6.2; 4.6.3; 4.6.4	41
9.4	Purchase Of Equipment / Instruments / Software			43
9.5	Services			43
9.6	Suppliers			44
10.0	COMPLAINTS	V1M2 Sec. 4.8	4.8	45
10.1	Overview			45
10.2	External Complaints			45
10.3	Internal Complaints			46
10.4	Management Review			46
11.0	CONTROL OF NON-CONFORMING WORK	V1M2 Secs. 4.9.1; 5.10.5	4.9.1; 5.10.5	47
11.1	Overview	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	47
11.2	Responsibilities And Authorities	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5; 5.2.7	4.9.1; 4.11.3; 4.11.5	47

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
11.3	Evaluation Of Significance And Actions Taken	V1M2 Secs. 4.9.1; 4.11.3; 4.11.5	4.9.1; 4.11.3; 4.11.5	48
11.4	Prevention Of Nonconforming Work	V1M2 Secs. 4.9.4; 4.11.2	4.9.2; 4.11.2	48
11.5	Method Suspension / Restriction (Stop Work Procedures)	V1M2 Secs. 4.9.1; 4.9.2; 4.11.5	4.9.1; 4.9.2; 4.11.5	48
12.0	CORRECTIVE ACTION	V1M2 Sec. 4.11		50
12.1	Overview	V1M2 Secs. 4.9.2; 4.11.1; 4.11.2	4.9.2; 4.11.1; 4.11.2	50
12.2	General	V1M2 Sec. 4.11.2; 4.11.3	4.11.2; 4.11.3	50
12.3	Closed Loop Corrective Action Process	V1M2 Sec. 4.11.2; 4.11.3; 4.11.4; 4.11.6; 4.11.7; 4.12.2	4.11.2; 4.11.3; 4.11.4; 4.12.2	51
12.4	Technical Corrective Actions	V1M2 Sec. 4.11.6		52
12.5	Basic Corrections	V1M2 Secs. 4.11.1; 4.13.2.3	4.11.1; 4.13.2.3	53
13.0	PREVENTIVE ACTION / IMPROVEMENT	V1M2 Secs. 4.10; 4.12.1; 4.12.2	4.10; 4.12.1; 4.12.2	58
13.1	Overview	V1M2 Secs. 4.15.1; 4.15.2	4.15.1; 4.15.2	58
13.2	Management Of Change			59
14.0	CONTROL OF RECORDS	V1M2 Secs. 4.2.7; 4.13.1.1; 4.13.3	4.2.7; 4.13.1.1	60
14.1	Overview	V1M2 Secs. 4.13.1.1; 4.13.1.2; 4.13.1.3; 4.13.1.4; 4.13.2.1; 4.13.2.2; 4.13.2.3; 4.13.3	4.13.1.1; 4.13.1.2; 4.13.1.3; 4.13.1.4; 4.13.2.1; 4.13.2.2; 4.13.2.3	60
14.2	Technical And Analytical Records	V1M2 Sec. 4.13.2.2 - 4.13.2.3	4.13.2.2; 4.13.2.3	63
14.3	Laboratory Support Activities			64
14.4	Administrative Records			65
14.5	Records Management, Storage And Disposal	V1M2 Sec. 4.13.3		65
15.0	AUDITS			67
15.1	Internal Audits	V1M2 Sec. 4.2.8.1; 4.14; 4.14.1; 4.14.2; 4.14.3; 4.14.5; 5.9.1; 5.9.2	4.14.1; 4.14.2; 4.14.3; 5.9.1; 5.9.2	67
15.2	External Audits	V1M2 Secs. 4.14.2; 4.14.3	4.14.2; 4.14.3; 4.14.4	68
15.3	Audit Findings	V1M2 Secs. 4.14.2; 4.14.3; 4.14.5		69

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
16.0	MANAGEMENT REVIEWS	V1M2 Sec. 4.1.6; 4.15; 4.15.1; 4.15.2	4.1.6; 4.15.1; 4.15.2	70
16.1	Quality Assurance Report			70
16.2	Annual Management Review	V1M2 Sec. 4.2.2; 4.15.3	4.2.2	70
16.3	Potential Integrity Related Managerial Reviews			71
17.0	PERSONNEL	V1M2 Secs. 5.2; 5.2.1	5.2.1	72
17.1	Overview	V1M2 Secs. 5.2.2; 5.2.3; 5.2.5	5.2.2; 5.2.3; 5.2.5	72
17.2	Education And Experience Requirements For Technical Personnel	V1M2 Secs. 5.2.1; 5.2.3; 5.2.4	5.2.1; 5.2.3; 5.2.4	72
17.3	Training	V1M2 Sec. 5.2.5	5.2.5	73
17.4	Data Integrity And Ethics Training Program	V1M2 Sec. 4.2.8.1; 5.2.7		75
18.0	ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS	V1M2 Sec. 5.3		76
18.1	Overview	V1M2 Secs. 5.3.1; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.3; 5.3.4; 5.3.5	76
18.2	Environment	V1M2 Secs. 5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	76
18.3	Work Areas	V1M2 Secs. 5.3.3; 5.3.4; 5.3.5	5.3.3; 5.3.4; 5.3.5	77
18.4	Floor Plan			77
18.5	Building Security	V1M2 Sec. 5.3.4	5.3.4	77
19.0	TEST METHODS AND METHOD VALIDATION	V1M2 Sec. 5.4.1	5.4.1	67
19.1	Overview	V1M2 Sec. 5.4.1	5.4.1; 5.4.5.1	78
19.2	Standard Operating Procedures (Sops)	V1M2 Secs. 4.2.8.5; 4.3.3.1; 5.4.2	4.3.3.1; 5.4.2	78
19.3	Laboratory Methods Manual	V1M2 Sec. 4.2.8.5		78
19.4	Selection Of Methods	V1M2 Secs. 4.13.3; 5.4.1; 5.4.2; 5.4.3. V1M4 Secs. 1.4; 1.5.1; 1.6.1; 1.6.2; 1.6.2.1; 1.6.2.2	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5.1; 5.4.5.2; 5.4.5.3	79

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
19.5	Laboratory Developed Methods And Non-Standard Methods	V1M2 Sec. 5.4.2. V1M4 Sec. 1.5.1	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	82
19.6	Validation Of Methods	V1M2 Sec. 5.4.2. V1M4 Secs. 1.5.1; 1.5.2; 1.5.2.1; 1.5.2.2; 1.5.3	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3	83
19.7	Method Detection Limits (mdl) / Limits Of Detection (LOD)	V1M2 Sec. 5.9.3. V1M4 Secs. 1.5.2; 1.5.2.1; 1.5.2.2	5.4.5.3	84
19.8	Instrument Detection Limits (Idl)	V1M2 Sec. 5.9.3		85
19.9	Verification Of Detection And Reporting Limits	V1M2 Sec. 5.9.3. V1M4 Sec. 1.5.2.1		85
19.10	Retention Time Windows	V1M2 Sec. 5.9.3		86
19.11	Evaluation Of Selectivity	V1M2 Sec. 5.9.3. V1M4 Sec. 1.5.4; 1.7.3.6		86
19.12	Estimation Of Uncertainty Of Measurement	V1M2 Sec. 5.1.1; 5.1.2; 5.4.6	5.1.1; 5.1.2; 5.4.6.1; 5.4.6.2; 5.4.6.3	86
19.13	Sample Reanalysis Guidelines	V1M2 Sec 5.9.1	5.9.1	87
19.14	Control Of Data	V1M2 Secs. 5.4.7.1; 5.4.7.2; 5.9.1	5.4.7.1; 5.4.7.2; 5.9.1	88
20.0	EQUIPMENT and CALIBRATIONS	V1M2 Secs. 5.5.4; 5.5.5; 5.5.6	5.5.4; 5.5.5; 5.5.6; 5.6.1	96
20.1	Overview	V1M2 Secs. 5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10	5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10; 5.6.1	96
20.2	Preventive Maintenance	V1M2 Secs. 5.5.1; 5.5.3; 5.5.7; 5.5.9	5.5.1; 5.5.3; 5.5.7; 5.5.9; 5.6.1	96
20.3	Support Equipment	V1M2 Secs. 5.5.10; 5.5.11; 5.5.13.1	5.5.10; 5.5.11; 5.6.2.1.2; 5.6.2.2.1; 5.6.2.2.2	97
20.4	Instrument Calibrations	V1M2 Secs. 5.5.8; 5.5.10; 5.6.3.1. V1M4 Sec. 1.7.1.1; 1.7.2	5.5.8; 5.5.9; 5.5.10; 5.6.1; 5.6.2; 5.6.3.1	99
20.5	Tentatively Identified Compounds (TICS) – GC/MS Analysis			103
20.6	Gc/Ms Tuning			103
21.0	MEASUREMENT TRACEABILITY			112
21.1	Overview	V1M2 Sec. 5.6.3.1	5.6.2.1.2; 5.6.2.2.2; 5.6.3.1	112

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
21.2	NIST-Traceable Weights And Thermometers	V1M2 Secs. 5.5.13.1; 5.6.3.1; 5.6.3.2	5.6.3.1; 5.6.3.2	112
21.3	Reference Standards / Materials	V1M2 Secs. 5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.6.4.1; 5.6.4.2; 5.9.1; 5.9.3	5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.9.1	113
21.4	Documentation And Labeling Of Standards, Reagents, And Reference Materials	V1M2 Secs. 5.6.4.2; 5.9.3		114
22.0	SAMPLING			116
22.1	Overview	V1M2 Secs. 5.7.1; 5.7.3	5.7.1; 5.7.3	116
22.2	Sampling Containers			116
22.3	Definition Of Holding Time			116
22.4	Sampling Containers, Preservation Requirements, Holding Times			116
22.5	Sample Aliquots / Subsampling	V1M2 Sec. 5.7.1	5.7.1	117
23.0	HANDLING OF SAMPLES	V1M2 Sec. 5.8.1	5.8.1	133
23.1	Chain Of Custody (COC)	V1M2 Secs. 5.7.2; 5.7.4; 5.8.4; 5.8.7.5; 5.8.8; 5.9.1	5.7.2; 5.8.4; 5.9.1	133
23.2	Sample Receipt	V1M2 Secs. 5.8.1; 5.8.2; 5.8.3; 5.8.5; 5.8.7.3; 5.8.7.4; 5.8.7.5	5.8.2; 5.8.3	134
23.3	Sample Acceptance Policy	V1M2 Secs. 5.8.6; 5.8.7.2		135
23.4	Sample Storage	V1M2 Secs. 5.7.4; 5.8.4	5.8.4	136
23.5	Hazardous Samples And Foreign Soils			137
23.6	Sample Shipping	V1M2 Sec. 5.8.2	5.8.2	137
23.7	Sample Disposal			137
24.0	ASSURING THE QUALITY OF TEST RESULTS			142
24.1	Overview	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	142
24.2	Controls	V1M2 Secs. 5.9.2; 5.9.3	5.9.2	142
24.3	Negative Controls	V1M2 Secs. 5.9.2; 5.9.3 V1M4 Secs. 1.7.3; 1.7.3.1; 1.7.4.1	5.9.2	142

Sec. No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
24.4	Positive Controls	V1M2 Secs. 5.9.2; 5.9.3. V1M4 Secs. 1.7.3; 1.7.3.2; 1.7.3.2.1; 1.7.3.2.2; 1.7.3.2.3	5.9.2	143
24.5	Sample Matrix Controls	V1M2 Secs. 5.9.2; 5.9.3. V1M4 Secs. 1.7.3 ; 1.7.3.3; 1.7.3.3.1; 1.7.3.3.2; 1.7.3.3.3	5.9.2	145
24.6	Acceptance Criteria (Control Limits)	V1M2 Sec. 5.9.3. V1M4 Secs. 1.7.4.2; 1.7.4.3		145
24.7	Additonal Procedures To Assure Quality Control	V1M2 Sec. 5.9.3. V1M4 Sec. 1.7.3.4		147
25.0	REPORTING RESULTS			149
25.1	Overview	-V1M2 Secs. 5.10.1; 5.10.2; 5.10.8	5.10.1; 5.10.2; 5.10.8	149
25.2	Test Reports	V1M2 Secs. 5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8; 5.10.10; 5.10.11	5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8	149
25.3	Reporting Level Or Report Type	V1M2 Secs. 5.10.1; 5.10.7; 5.10.8	5.10.1; 5.10.7; 5.10.8	151
25.4	Supplemental Information For Test	V1M2 Secs. 5.10.1; 5.10.3.1; 5.10.5	5.10.1; 5.10.3.1; 5.10.5	152
25.5	Environmental Testing Obtained From Subcontractors	V1M2 Secs. 4.5.5; 5.10.1; 5.10.6	5.10.1; 5.10.6	153
25.6	Client Confidentiality	V1M2 Secs. 4.1.5; 5.10.7	4.1.5; 5.10.7	153
25.7	Format Of Reports	V1M2 Sec. 5.10.8	5.10.8	153
25.8	Amendments To Test Reports	V1M2 Sec. 5.10.9	5.10.1; 5.10.9	153
25.9	Policies On Client Requests For Amendments	V1M2 Secs. 5.9.1; 5.10.9	5.9.1; 5.10.1; 5.10.5; 5.10.9	154

## LIST OF TABLES

Table No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005 (E) Reference	Page No.
12-1	Example – General Corrective Action Procedures	V1M2 Sec. 4.11.6. V1M4 Sec. 1.7.4.1	4.11.2	55
14-1	Record Index		4.13.1.1	60
14-2	Example: Special Record Retention Requirements			62
15-1	Types Of Internal Audits And Frequency		4.14.1	67
20-1	Example: Instrumentation List1		5.5.4; 5.5.5	104
20-2	Example: Schedule Of Routine Maintenance			105
24-1	Example – Negative Controls			142
24-3	Sample Matrix Control			145

## LIST OF FIGURES

Figure No.	Title	2009 TNI Standard Reference	ISO/IEC 17025:2005(E) Reference	Page No.
4-1	Corporate And Laboratory Organization Charts	V1M2 Sec. 4.1.5	4.1.3; 4.1.5; 4.2.6	19
8-1	Example 1 - Subcontracted Sample <b>Form – Form</b>			39
12-1	Example - Corrective Action Report			54
19-1	Example - Demonstration Of Capability Documentation			93
19-2	Example: Work Flow			95
23-1	Example: Chain Of Custody (COC)			138
23-2	Example: Sample Acceptance Policy	V1M2 Sec. 5.8.6; 5.8.7.1. V1M4 Sec. 1.7.5		139
23-3	Example: Cooler Receipt Form		5.8.3	140

## LIST OF APPENDICES

Appendix No.	Title	Page No.
1	Laboratory Floor Plan	155
2	Glossary/Acronyms	156
3	Laboratory Certifications, Accreditations, Validations	165
4	Listing Of Methods Performed	166
5	Data Qualifiers	172

## REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CA-Q-S-008	Management Systems Review
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CW-L-S-002	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CW-L-P-004	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

## REFERENCED LABORATORY SOPs

SOP Reference	Title
WS-PQA-013	Procedures to Address Customer Complaints
WS-QA-0050	Management of Change
WS-QA-0009	Document Archiving
WS-QA-0022	Employee Orientation and Training
WS-QA-0021	Preparation and Management of Standard Operating Procedures
WS-QA-0006	Method Detection Limits (MDL) and Instrument Detection Limits (IDL)
WS-PQA-0011	Manual Integration Documentation Procedures
WS-QA-0018	Subsampling and Compositing of Samples
WS-QA-0003	Sample Receipt and Procedures

## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
Dioxins	WS-ID-0005	7.5	4/2/2013	Analysis of Samples for Polychlorinated Dioxins and Furans by HRGC/HRMS
Dioxins	WS-ID-0006	1.3	2/1/2013	Tetra through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS
Dioxins	WS-ID-0007	3.6	5/5/2012	Analysis of Tetra-through Octa Chlorinated Dioxins and Furans by Isotope Dilution(HRGC/HRMS by Method 1613B
Dioxins	WS-ID-0011	4.4	2/28/2013	Analysis of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans by Methods 8280A and 8280B
Dioxins	WS-ID-0013	4.2	3/28/2013	PCB Analysis by HRGC/HRMS
Dioxins	WS-ID-0014	5.6	2/6/2012	Analysis of Organochlorine Pesticides by High Resolution Gas Chromatography/High Resolution Mass Spectrometry
Dioxins	WS-ID-0018	1.2	11/8/2011	PCB Analysis by HRGC/HRMS
Dioxins	WS-IDP-0005	1.5	12/20/2012	Preparation of Samples for Analysis of Polychlorinated Dioxins and Furans for Analysis by HRGC/HRMS
Dioxins	WS-IDP-0007	1.7	6/29/2013	Preparation of Samples for Tetra-through Octa Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS by Method 1613B
Dioxins	WS-IDP-0009	2.2	12/21/2012	Extraction of Method 0023A - Tetra - through Octa Chlorinated Dioxins and furans by Isotope Dilution HRGC/HRMS
Dioxins	WS-IDP-0009	2.2	12/18/2012	Extraction of Method 0023A - Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS
Dioxins	WS-IDP-0011	2.4	5/24/2013	Extraction of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans for Low Resolution GC/MS Analysis
Dioxins	WS-IDP-0013	2.3	5/22/2012	PCB Preparation for Analysis by HRGC/HRMS
Dioxins	WS-IDP-0018	1.0	6/21/2011	PCB Preparation for Analysis by HRGC/HRMS (Method 1668C)
Dioxins	WS-WI-0028	2	4/14/2010	High Resolution Dioxin Screening Procedure
EH & S	WS-EHS-0001	4.3	9/7/2013	Waste Disposal
EH & S	WS-EHS-0002	1	10/19/2011	Radiation Safety Duties & Responsibilities
EH & S	WS-PEHS-001	2.1	2/12/2010	Respiratory Protection Plan
EH & S	WS-PEHS-002	6.2	6/29/2012	Sacramento Addendum to Corporate Safety Manual
General Chemistry	WS-WC-0002	4.2	9/6/2012	Determination of All Types of Residue in Water, Wastes, and Soil Samples
General Chemistry	WS-WC-0009	3.1	4/30/2013	Determination of Anions by Ion Chromatography
General Chemistry	WS-WC-0010	5	12/18/2012	Determination of Perchlorate by Ion Chromatography
General Chemistry	WS-WC-0012	3.1	3/7/2013	Determination of Hydrogen Halides and Halogen Emissions from Stationary Sources by Ion Chromatography
General Chemistry	WS-WC-0020	7.4	5/25/2012	Determination of Hexavalent Chromium by Manual Colorimetric Method

## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
General Chemistry	WS-WC-0028	4.3	7/17/2012	Determination of Alkalinity, Conductivity, and pH
General Chemistry	WS-WC-0036	4.4	3/28/2013	Determination of Nitrate, Nitrite, and Nitrate + Nitrite by Automated Colorimetry - Cadmium Reduction Method
General Chemistry	WS-WC-0040	3.2	5/22/2012	Determination of Chemical Oxygen Demand
General Chemistry	WS-WC-0044	6.2	12/23/2010	EPA Method 9045D pH Soils
General Chemistry	WS-WC-0049	4.2	6/28/2013	Deionized Water Leaching Procedure for General Chemistry Analyses
General Chemistry	WS-WC-0050	3.7	9/6/2012	Preparation and Analysis of Nitrocellulose in Aqueous and Soil/Sediment Samples by Colorimetric AutoAnalyzer
General Chemistry	WS-WC-0052	2.2	5/28/2013	Glassware Cleaning for Inorganic Analyses
Inorganic Preparation	WS-IP-0001	5.2	10/23/2012	Acid Digestion of Aqueous Samples by SW846
Inorganic Preparation	WS-IP-0002	5.3	1/19/2012	Acid Digestion of Soils, SW-846 Method 3650B
Inorganic Preparation	WS-IP-0003	4.1	4/4/2013	Waste Extraction Test for CCR STL/((Citrate Buffer/Deionized Water)
Inorganic Preparation	WS-IP-0004	3.5	1/23/2013	Toxicity Characteristic Leaching Procedure and Synthetic Precipitation Leaching Procedure
Inorganic Preparation	WS-IP-0006	3.1	9/6/2012	Method for the Determination of Particulate Matter in the Atmosphere as TSP on PM10 (High Volume Method)
Inorganic Preparation	WS-IP-0007	2.1	5/3/2010	Determination of Metal Emissions from Stationary Source (EPA Method 29, EPA SW846, Method 0060, CARB Method 436)
Inorganic Preparation	WS-IP-0008	4.1	12/17/2010	Metals Matrix Matching for Analysis of Dissolved Metals
Inorganic Preparation	WS-IP-0010	3	7/16/2009	Preparation of Metals from Particulate Matter Collected on High Volume Air Filters Using ICP, ICP Trace, and ICPMS Analysis
Inorganic Preparation	WS-IP-0012	3.3	5/31/2013	Determination of Particulate Emissions from Stationary Sources
LC/LCMS	WS-DW-0002	3.1	8/12/2011	Determination of Acetamide Herbicide Degradates by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) by EPA Method 535
LC/LCMS	WS-DW-0004	1	2/1/2013	Determination of Selected Perfluorinated Alkyl Acids (PFAA) in Drinking Water by Solid Phase Extraction (SPE) and Analysis by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) by Method 537
LC/LCMS	WS-LC-0001	9.5	8/23/2013	Determination of Nitroaromatics, Nitramines, and Specialty Explosives using LC/MS, Based on Method 8321A, SW846
LC/LCMS	WS-LC-0004	2.4	3/7/2012	Determination of Chemical Warfare Degradates in Water and Soil by Liquid Chromatography/Electrospray/Mass Spectrometry (LC/ES/MS)
LC/LCMS	WS-LC-0006	1.2	7/12/2011	Determination of Diamonitoluenes by HPLC/UV

## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
LC/LCMS	WS-LC-0009	5.1	5/3/2013	Determination of Nitroaromatics, Nitramines, and Speciality Explosives Based on Method 8330, SW-846
LC/LCMS	WS-LC-0010	3.4	3/20/2013	Determination of Nitroguanidine Based on Method 8330, SW-846
LC/LCMS	WS-LC-0012	6.1	10/17/2012	Determination of Perchlorate by Liquid Chromatography Coupled with Tandem Mass Spectrometry (LC/MS/MS) by Method 6850
LC/LCMS	WS-LC-0013	3.1	9/24/2012	Determination of 4-Chlorobenzene Sulfonic Acid in Water and Soil by Liquid Chromatography/Electrospray/Mass Spectrometry
LC/LCMS	WS-LC-0018	1.4	10/17/2012	Determination of Perchlorate by Liquid Chromatography Coupled with Tandem Mass Spectrometry
LC/LCMS	WS-LC-0019	4.2	9/24/2012	Determination of TOHI Flotation Reagent and Primary Components by Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)
LC/LCMS	WS-LC-0024	3.1	6/28/2013	Determination of Pharmaceuticals and Personal Care Products, Antibacterials, Steroids and Hormones by Liquid Chromatography with Tandem Mass Spectrometry (LC/MS/MS)
LC/LCMS	WS-LC-0025	1.2	6/5/2013	Perfluorinated Compounds (PFCs) in Water, Soils, Sediments and Tissue by LC/MS/MS
LC/LCMS	WS-WI-0015	2	11/15/2010	Procedure for the Preparation and Analysis of Explosives from Modified STEM Train
LC/LCMS	WS-WI-0029	0	1/29/2010	Nitrophenols and Picramic Acid by Method 8330
Metals	WS-MT-0001	3.5	6/27/2013	Analysis of Metals by Inductively Coupled Plasma/Mass Spectrometry
Metals	WS-MT-0003	5.3	11/9/2011	Inductively Coupled Plasma-Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analysis, SW-846 Method 6010B
Metals	WS-MT-0005	5.4	7/11/2012	Preparation and Analysis of Mercury in Aqueous Samples by Cold Vapor Atomic Absorption, SW-846 7470A
Metals	WS-MT-0007	5.2	1/16/2012	Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption, SW-846 7471A
Organic Preparation	WS-IDP-0020	2.2	3/13/2013	Preparation of Nitrosamines for Analysis by Isotope Dilution GC/MS
Organic Preparation	WS-OP-0001	4	8/9/2103	Extraction of Semivolatile Organic Compounds for Analysis by Method 8270C, Based on SW-846 3500 Series and 3600 Series, and PAH-SIM by Internal Standard and Isotope Dilution

## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
Organic Preparation	WS-OP-0002	3.9	4/29/2013	Extraction and Cleanup of Organic Compounds from Waters and Soils, Based on SW-846 3500 Series and 3600 Series Methods for Analysis by Methods 8081A and 8082
Organic Preparation	WS-OP-0004	5	8/16/2013	Extraction and Cleanup of Organic Compounds from Waters and Soils, Based on SW-846 3500 Series and 3600 Series Methods for Analysis by Methods 8015B, CA-LUFT, NW-TPH, and AK 102/103
Organic Preparation	WS-OP-0005	2.3	4/13/2011	Preparation of Organosulfur Compounds (OS) and Tear Gas Degradates (TGD) in Water and Soil for Analysis by Gas Chromatograph with a Mass Spectrometer (GC/MS)
Organic Preparation	WS-OP-0006	3.1	9/28/2012	Preparation and Extraction of Semi-Volatiles on PUF (Polyurethane Foam) XAD-2 Resin Samples for GC/MS Analysis
Organic Preparation	WS-OP-0007	4.3	9/29/2012	Extraction of Organochlorine Pesticides and PCBs for GC/ECD Analysis (Polyurethane Foam Samples, PUF)
Organic Preparation	WS-OP-0008	3.1	12/18/2012	Preparation of Modified Method 5 (SW-846 Method 0010/3542) Train Components for Analysis by SW-846 Method 8270
Organic Preparation	WS-OP-0011	3.1	1/29/2010	Cleaning of Glassware (Organics)
Organic Preparation	WS-OP-0012	4.2	5/10/2013	Gel-Permeation Cleanup
Organic Preparation	WS-OP-0013	4.2	3/19/2013	Determination of Percent Moisture
Organic Preparation	WS-OP-0015	5.3	12/11/2011	HEM / SGT-HEM by Method 1664A and SW-846 Methods 9070A and 9071B
Organic Preparation	WS-OP-0016	1.1	11/10/2011	Sonicator Tuning
Organic Preparation	WS-OP-0018	1.4	9/13/2012	Extraction of Semivolatile Alkylphenol Compounds for Analysis by GC/MS-SIM
Organic Preparation	WS-OP-0024	3.1	8/26/2013	Preparation of Samples for Determination of Pharmaceuticals and Personal Care Products, Antibacterials, Steroids and Hormones by Liquid Chromatography Coupled with Tandem Mass Spectrometry (LC/MS/MS)
Organic Preparation	WS-OP-4177	3	9/15/2008	Despatch VRE2-35-1E Oven Operations
Organic Preparation	WS-WI-0018	3.1	4/17/2012	Tissue Sample Handling and Extraction for a Variety of Methods
Organic Preparation	WS-WI-0023	1.2	2/2/2012	XAD Resin Trap Sampling Pre-Spike Procedures for 0010/8270, 1668 PCB and M23 or M0023A Sampling Train
Organic Preparation	WS-WI-0027	1	2/19/2009	Waste Dilution Procedure for PAH-SIM (Isotope Dilution)
Organic Preparation	WS-WI-0031	1.2	3/7/2011	Homogenization and Incremental Sampling Methodology
Program Management	WS-PM-0001	4	11/10/2011	Final Report Assembly and Third Level Data Review
Program Management	WS-PM-0002	2	4/15/2009	Log Release and Login Review
Program Management	WS-PM-0003	3.1	7/1/2011	Program Setup and Dissemination
Quality Assurance	WS-IT-0001	4.0	9/1/2011	Data Backup Procedures
Quality Assurance	WS-PQA-003	6.1	11/11/2011	Quality Control Program



## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
Quality Assurance	WS-PQA-004	3	3/26/2009	Rounding and Significant Figures
Quality Assurance	WS-PQA-005	4	1/3/2013	Results and Report Revisions
Quality Assurance	WS-PQA-008	5.1	3/8/2012	Data Recording Policy
Quality Assurance	WS-PQA-010	4.1	9/6/2012	Maintaining Time Integrity
				Manual Integration Documentation
Quality Assurance	WS-PQA-011	4.4	4/16/2013	Procedures
Quality Assurance	WS-PQA-012	4.2	7/5/2013	Technical Data Review Requirements
Quality Assurance	WS-PQA-013	3	1/27/2009	Procedures to Address Customer Complaints
Quality Assurance	WS-PQA-017	2	1/29/2009	Electronic Reporting & Client Deliverables
				Quality Assurance Project Plan (QAPP)
Quality Assurance	WS-PQA-018	1.1	9/12/2013	Review
				Implementation of the DOD QSM Version 4.2, and AFCEE QAPP 4.0
Quality Assurance	WS-PQA-021	4.3	12/18/2012	
Quality Assurance	WS-PQA-022	1	11/26/2012	A2LA Requirement Summary
				Implementation of SW-846 Update IV Method
Quality Assurance	WS-PQA-023	1	11/9/2011	Versions
Quality Assurance	WS-QA-0001	7.2	10/15/2012	Building Security
				Maintenance and Calibration Check of Fixed and Adjustable Volume Autopipettors, Autodispensers and Volumetric Containers
Quality Assurance	WS-QA-0004	4.2	12/22/2011	
				Temperature Monitoring and Corrective
Quality Assurance	WS-QA-0005	6.2	3/8/2013	Actions for Refrigerators and Freezers
				Method Detection Limits (MDL) and
Quality Assurance	WS-QA-0006	5.1	2/20/2010	Instrument Detection Limits (IDL)
Quality Assurance	WS-QA-0009	5	9/9/2009	Document Archiving
				Monitoring of Reagent-Grade Laboratory
Quality Assurance	WS-QA-0014	2.2	9/25/2012	Water
Quality Assurance	WS-QA-0016	5.4	2/21/2013	Thermometer Calibration
				Standards and Reagents and Quality Control
Quality Assurance	WS-QA-0017	4	5/24/2013	Check Procedures
Quality Assurance	WS-QA-0018	3.1	11/29/2012	Subsampling and Compositing of Samples
				Preparation and Management of Standard
Quality Assurance	WS-QA-0021	3.2	11/9/2012	Operating Procedures
Quality Assurance	WS-QA-0022	3.1	3/4/2011	Employee Orientation and Training
				Nonconformance and Corrective Action
Quality Assurance	WS-QA-0023	4	2/1/2013	System
Quality Assurance	WS-QA-0024	3.2	9/6/2012	Independent QA Data Review
Quality Assurance	WS-QA-0025	3.1	5/23/2013	Glassware Handling Safety
Quality Assurance	WS-QA-0027	2.2	12/3/2010	Responsibilities of a Spike Witness
				Incremental Sampling Methodology of Soils
Quality Assurance	WS-QA-0028	3.3	6/27/2012	and Sediments
Quality Assurance	WS-QA-0030	1.2	1/20/2012	Use of Solvent Delivery/Cycletainer Systems
				Verification and Security of Spreadsheet
Quality Assurance	WS-QA-0031	1	10/14/2011	Applications
				Cleaning, Certification and Preparation of
Quality Assurance	WS-QA-0032	0	2/20/2013	Sampling Equipment
Quality Assurance	WS-QA-0041	6.4	3/7/2013	Calibration and Calibration Check of Balances
Quality Assurance	WS-QA-0050	1.0	7/9/2010	Management of Change Procedures
				Arizona compliant Samples by EPA 8270B
Quality Assurance	WS-WI-0007	3.0	12/22/2009	and 8270C
				Arizona Data Qualifiers for Arizona Compliant
Quality Assurance	WS-WI-0012	5	5/31/2013	Samples
Quality Assurance	WS-WI-0013	2.0	12/21/2009	Method 6020 for Arizona Compliant Samples

## Standard Operating Procedures Listing for TestAmerica Sacramento

Department	Document Number	Revision	Active Date	SOP Title
Quality Assurance	WS-WI-0014	2.0	12/22/2009	Samples
Sample & Bottle Management	WS-QA-0002	4.2	9/14/2012	Procedure for the Set-Up, Maintenance, and Analysis of Holding Blanks for Volatile Refrigerators
Sample & Bottle Management	WS-QA-0003	11.7	6/27/2013	Sample Receipt and Procedures
Sample & Bottle Management	WS-QA-0007	9.3	5/31/2012	Bottle and Cooler Preparation
Sample & Bottle Management	WS-WI-0033	1.1	10/18/2011	Preparing Samples Submitted in EnCore Samplers
Semivolatiles	WS-GC-0001	4.6	9/6/2013	Chromatographic Analysis Based on SW-846 Methods 8000B/8000C, 8081A/808B, and Compendium Methods TO-4, TO-4A, TO-10 and TO-10A
Semivolatiles	WS-GC-0002	4.5	4/10/2013	Chromatographic Analysis Based on SW-846 Method 8000B, 8082, and Compendium Methods TO-4, TO-10 and TO-10A
Semivolatiles	WS-GC-0007	5.6	6/21/2013	Gas Chromatographic Analysis of Total Petroleum Hydrocarbons
Semivolatiles	WS-MS-0003	7.4	8/10/2013	Preparation and Analysis of Organosulfur Compounds (OS) and Tear Gas Degradates (TGD) in Water and Soil by Gas Chromatograph with a Mass Spectrometer (GC/MS)
Semivolatiles	WS-MS-0005	4.4	6/22/2013	GC/MS Analysis Based on Method 8270C
Semivolatiles	WS-MS-0006	3.2	7/16/2010	Determination of Polycyclic Aromatic Hydrocarbons (PAH) by GC/MS - Isotope Dilution
Semivolatiles	WS-MS-0008	2.4	6/21/2013	Determination of Polycyclic Aromatic Hydrocarbons (PAH) by GC/MS-SIM Internal Standard Techniques
Semivolatiles	WS-MS-0010	1.5	5/8/2013	Determination of Alkylphenol Compounds by GC/MS-SIM Internal Standard Technique
Semivolatiles	WS-MS-0011	1	8/25/2009	Analysis of 1,4-Dioxane by GC/MS SIM
Semivolatiles	WS-MS-0012	1.5	3/9/2102	Determination of Nitrosamines by Capillary Column Gas Chromatography with Large Volume Injection and Chemical Ionization
Volatile Air	WS-GCA-0018	1.0	3/13/2013	Tandem Mass Spectrometry Determination of TPH, MBTEX, Alkanes, and Carbon Chains in Air Samples using Gas Chromatography
Volatile Air	WS-GCA-0020	0	4/17/2013	Determination of Fixed Gases (Reformed Gases) in Air Samples using Gas Chromatography [ASTM D-1946 / EPA 3C]
Volatile Air	WS-GCA-019	0	4/15/2013	Determination of Volatiles Sulfur Compounds from Stationary Sources (EPA 15, 16)
Volatiles	WS-MS-0007	4.4	2/23/2012	Determination of Volatile Organics and Total Purgeable Petroleum Hydrocarbons by GC/MS
Volatiles	WS-MSA-0015	1.0	3/8/2013	Determination of Low-Level Volatile Organics in Ambient / Indoor Whole Air Samples Using GC/MS-Scan Mode

Laboratory	Program	Authority	Identification	Expiration Date
TestAmerica Sacramento	DoD ELAP	A2LA	2928-01	01/31/2014
TestAmerica Sacramento	Federal	US Fish & Wildlife	LE148388-0	12/31/2013
TestAmerica Sacramento	Federal	USDA	P330-11-00436	12/30/2014
TestAmerica Sacramento	Federal	USEPA UCMR	CA00044	11/06/2014
TestAmerica Sacramento	NELAP	California	1119CA	01/31/2014
TestAmerica Sacramento	NELAP	Florida	E87570	06/30/2014
TestAmerica Sacramento	NELAP	Illinois	200060	03/17/2014
TestAmerica Sacramento	NELAP	Kansas	E-10375	10/31/2013
TestAmerica Sacramento	NELAP	Louisiana	30612	06/30/2014
TestAmerica Sacramento	NELAP	New Jersey	CA005	06/30/2014
TestAmerica Sacramento	NELAP	New York	11666	04/01/2014
TestAmerica Sacramento	NELAP	Oregon	CA200005	03/28/2014
TestAmerica Sacramento	NELAP	Pennsylvania	68-01272	03/31/2014
TestAmerica Sacramento	NELAP	Texas	T104704399-08-TX	05/31/2014
TestAmerica Sacramento	NELAP	Utah	QUAN1	01/31/2014
TestAmerica Sacramento	State Program	Alaska (UST)	UST-055	12/18/2013
TestAmerica Sacramento	State Program	Arizona	AZ0708	08/11/2014
TestAmerica Sacramento	State Program	Arkansas DEQ	88-0691	06/17/2014
TestAmerica Sacramento	State Program	Connecticut	PH-0691	06/30/2015
TestAmerica Sacramento	State Program	Guam	N/A	08/31/2013 *
TestAmerica Sacramento	State Program	Hawaii	N/A	01/31/2014
TestAmerica Sacramento	State Program	Michigan	9947	01/31/2014
TestAmerica Sacramento	State Program	Nebraska	NE-OS-22-13	01/31/2014
TestAmerica Sacramento	State Program	Nevada	CA44	07/31/2014
TestAmerica Sacramento	State Program	Northern Mariana Islands	MP0007	02/01/2014
TestAmerica Sacramento	State Program	South Carolina	87014	06/30/2014
TestAmerica Sacramento	State Program	Washington	C581	05/05/2014
TestAmerica Sacramento	State Program	West Virginia	9930C	12/31/2013
TestAmerica Sacramento	State Program	Wyoming	8TMS-Q	01/31/2014

## **Appendix 10 – Benzene Waste NESHAP Training Reporting**

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHAP Waste Sampling R3 (EASREG012)</b>				
<b>Site 04</b>				
	Dapkus, Kestutis V.	10/22/13	2	0.25
	Gordon, Terry L.	12/31/13	1	0.25
	Madison, James L.	12/23/13	1	0.25
	Mik, Brandon J.	09/18/13	1	1.00
	Moffett, Corie C.	08/11/13	1	1.00
	Reed II, Llewellyn G.	10/11/13	1	0.25
	Rodriguez, Beata M.	09/19/13	1	1.00
	Zavesky, Charles J.	07/08/13	1	1.00
<b>Site L6</b>				
	Grimmer, Natalie R.	07/12/13	1	1.00
<b>Attendance Count: 9</b>				
<b>(R) Benzene NESHAP-NSPS QQQ SOP Refresh (EASREG223)</b>				
<b>Site 04</b>				
	Arredondo, Melissa A.	11/06/13	1	0.25
	Asztalos, William P.	10/10/13	1	1.00
	Baehler, Desiree A.	12/27/13	1	0.25
	Baird, Jeffrey D.	12/03/13	1	0.25
	Baran, Mark A.	12/13/13	1	0.25
	Barot, Vinod	08/31/13	2	1.00
	Beda, Sarah M.	08/27/13	2	1.00
	Benkovich, Kris E.	12/05/13	1	0.25
	Bernacky, William N.	11/20/13	1	0.25
	Blanco, Gloria A.	07/23/13	1	1.00
	Blank, Anthony	12/09/13	1	0.25
	Board, Marc N.	12/14/13	1	0.25
	Bobalik, Kevin M.	12/15/13	1	0.25
	Bobos, Ryan M.	10/16/13	2	0.25
	Bodie, Mollie J.	11/12/13	1	0.25
	Boland, Christopher C.	09/23/13	1	1.00
	Bultema, Lee E.	10/11/13	1	1.00
	Bunde Jr, Edward G.	12/30/13	1	0.25
	Burns, Robert J.	12/11/13	1	0.25
	Castellanos, Daniel	12/16/13	1	0.25
	Chorich, Peter A.	12/30/13	1	0.25
	Cimarolli, Ronald A.	11/01/13	1	0.25
	Cleve, John D.	11/15/13	1	0.25
	Cloghessy, James F.	12/02/13	1	0.25
	Cornelius, Chadd T.	11/29/13	1	0.25

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHP-NSPS QQQ SOP Refresh (EASREG223)</b>				
	Cornelius, Douglas	09/28/13	1	1.00
	Couch, Bobby J.	09/22/13	1	1.00
	Cribari Jr, Dominic J.	10/13/13	1	1.00
	Croft, Roger D.	09/10/13	1	1.00
	Dapkus, Kestutis V.	10/22/13	2	0.25
	Davis, Brian M.	12/03/13	1	0.25
	Dennis, Phillip G.	10/01/13	1	1.00
	Dewier, Jeffrey M.	12/11/13	1	0.25
	Dobrowolski Jr, Stefan J.	11/04/13	1	0.25
	Doyle, Michael A.	12/10/13	1	0.25
	Dumas, Michael M.	12/17/13	1	0.25
	Espinoza, James	10/05/13	1	1.00
	Esquivel, Everardo	11/07/13	1	0.25
	Etnire, Matthew M.	11/17/13	1	0.25
	Farley, Robert M.	12/03/13	1	0.25
	Ferguson, Anthony C.	10/09/13	1	1.00
	Ferry, Steven	09/16/13	1	1.00
	Fischer, Gregory R.	08/25/13	2	1.00
	Fitzsimons, James N.	10/15/13	1	1.00
	Ford, Ralph J.	12/15/13	1	0.25
	Furto, Jeremy J.	12/16/13	1	0.25
	Gabbert, Mark	07/08/13	1	1.00
	Gallegos, Leonard E.	07/03/13	1	1.00
	Galloway, Caleb B.	11/01/13	1	0.25
	Gazda, Gregory J.	11/05/13	1	0.25
	Gerbert, Mark P.	11/16/13	1	0.25
	Gilbert, Brett O.	09/06/13	1	1.00
	Gingras, George G.	07/10/13	1	1.00
	Gliem, Robert E.	12/16/13	1	0.25
	Gordon, Terry L.	12/31/13	1	0.25
	Granger II, William G.	11/14/13	1	0.25
	Grzyski, Joseph M.	12/16/13	1	0.25
	Guy, Shaun P.	11/05/13	1	0.25
	Haddad, Joseph A.	11/19/13	1	0.25
	Hamilton, Russell H.	09/26/13	1	1.00
	Henderson, Lindsay M.	12/15/13	1	0.25
	Hetzel Jr, Joseph J.	08/12/13	2	1.00
	Holguin Jr, Cesar J.	12/03/13	1	0.25
	Hornyak, Mark S.	08/12/13	1	1.00
	Hruskocy, David	12/27/13	1	0.25
	Hughes, Eddie	12/11/13	1	0.25

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHA-NSPS QQQ SOP Refresh (EASREG223)</b>				
	Irizarry Jr, Alfonso	10/17/13	2	0.25
	Jackson, Boyce	10/24/13	2	0.25
	Jakubowski, Eric E.	09/30/13	1	1.00
	Jancich, Gregory M.	10/20/13	2	0.25
	Jansky II, Raymond W.	12/09/13	1	0.25
	Jeffries, Tanisha D.	09/06/13	1	1.00
	Jewett, Bernard A.	08/30/13	2	1.00
	Jewett, Garrison E.	07/12/13	1	1.00
	Johnson, Howard	12/22/13	1	0.25
	Jones, Jeffrey C.	12/16/13	1	0.25
	Jordan, Chris L.	12/17/13	1	0.25
	Julovich, Steven M.	12/08/13	1	0.25
	Kammerer, Thomas M.	07/05/13	1	1.00
	Kammerer, Timothy M.	12/31/13	1	0.25
	Kendall, Julie	11/22/13	1	0.25
	Kietzman, Joshua G.	12/09/13	1	0.25
	Kreischer, Keith	12/12/13	1	0.25
	Krenkel, David W.	10/23/13	2	0.25
	Kristek, Michael D.	08/06/13	1	1.00
	Kruhaj, Kenneth J.	12/30/13	1	0.25
	Kulina, Philip J.	08/03/13	1	1.00
	Lambert, Randy D.	10/16/13	2	0.25
	Lawson, Elliott D.	12/08/13	1	0.25
	Leech, Gregory A.	09/16/13	1	1.00
	Licina, Michael	12/06/13	1	0.25
	Lindeman, Timothy A.	12/26/13	1	0.25
	Long, Christine L.	10/09/13	1	1.00
	Lopez, Luis A.	10/08/13	1	1.00
	Lucas, Richard G.	12/19/13	1	0.25
	Madison, James L.	09/03/13	1	1.00
	Madry, Quentin C.	08/18/13	2	1.00
	Malmquist, Gregg P.	07/06/13	1	1.00
	Mangiaracina, Philip B.	11/11/13	1	0.25
	Markusic, Mark D.	07/30/13	1	1.00
	Martin, Jim M.	11/12/13	1	0.25
	Martinez, William	11/28/13	1	0.25
	Maty Jr, Ronald J.	11/16/13	1	0.25
	McC Campbell, Michael L.	12/16/13	1	0.25
	McGee, Michael L.	12/25/13	1	0.25
	McMurray III, Thattus M.	12/25/13	1	0.25
	Mech, William J.	12/30/13	1	0.25

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHA-NSPS QQQ SOP Refresh (EASREG223)</b>				
	Metts, Andrew M.	08/02/13	1	1.00
	Miegl, Jonathan A.	11/17/13	1	0.25
	Mik, Brandon J.	08/23/13	2	1.00
	Miller, Satanya N.	12/03/13	1	0.25
	Miranda, Christopher R.	12/30/13	1	0.25
	Miranda, Elsa G.	12/19/13	1	0.25
	Miskus, Kenneth J.	11/10/13	1	0.25
	Moffett, Corie C.	08/11/13	2	1.00
	Montgomery, Chris	12/03/13	1	0.25
	Morales, Jorge	09/18/13	1	1.00
	Morris, Michael D.	09/23/13	1	1.00
	Morrison, Joseph P.	08/01/13	1	1.00
	Munro, Arthur W.	10/05/13	1	1.00
	Myers, Julie M.	12/01/13	1	0.25
	Neal, Leonard A.	09/21/13	1	1.00
	Nesbit, Malcolm C.	12/03/13	1	0.25
	Nussen, Bernard E.	09/12/13	1	1.00
	O'Larey, Ryan F.	11/16/13	1	0.50
	Orsi, Phillip F.	09/30/13	1	1.00
	Overall Jr, Rex L.	10/07/13	1	1.00
	Owens, Neal K.	07/29/13	1	1.00
	Oziemkowski, John	10/15/13	1	1.00
	Palmer, LaMont A.	07/19/13	1	1.00
	Peart, Brock T.	12/28/13	1	0.25
	Perez, Jaime	12/09/13	1	0.25
	Perino, James	10/25/13	2	0.25
	Pinkerton, Charles S.	12/07/13	1	0.25
	Poats, Devin J.	12/01/13	1	0.25
	Polster, Dale D.	12/15/13	1	0.25
	Pustelnik, Joseph J.	09/13/13	1	1.00
	Rarick, Stephan S.	12/16/13	1	0.25
	Reed II, Llewellyn G.	10/11/13	1	1.00
	Restauri, Nicholas T.	07/07/13	1	1.00
	Reynolds, Tracy D.	12/16/13	1	0.25
	Riley, Nathan C.	10/26/13	2	0.25
	Ristevski, Nikola	07/16/13	1	1.00
	Rivera, Elisa	10/11/13	1	1.00
	Rodriguez, Beata M.	09/19/13	1	1.00
	Rodriguez, Ricardo	12/23/13	1	0.25
	Rogers, James G.	12/14/13	1	0.25
	Rohrbacher, Mark	12/16/13	1	0.25

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHA-NSPS QQQ SOP Refresh (EASREG223)</b>				
	Rokosz, Peter J.	07/14/13	1	1.00
	Salazar, Wilfred	12/04/13	1	0.25
	Salus Jr, Joseph J.	12/16/13	1	0.25
	Savich, Jason B.	12/20/13	1	0.25
	Schaller, Bryan K.	12/09/13	1	0.25
	Schisley, James M.	09/06/13	1	1.00
	Schmidt, Matthew C.	10/04/13	1	1.00
	Scudder, Cindy	11/08/13	1	0.25
	Segally, Daniel J.	12/02/13	1	0.25
	Seljan, Terry J.	10/08/13	1	1.00
	Sellin, Brian K.	12/11/13	1	0.25
	Sharpe, Walter L.	12/07/13	1	0.25
	Shepherd, David A.	10/22/13	2	0.25
	Skierkiewicz, Vincent R.	08/19/13	2	1.00
	Smith, Timothy A.	12/03/13	1	0.25
	Smolar, David W.	10/05/13	1	1.00
	Solomon, Thomas W.	08/24/13	2	1.00
	Spisak, David A.	12/16/13	1	0.25
	Starceвич, Gregory V.	12/09/13	1	0.25
	Starks, Barrett R.	08/16/13	2	1.00
	Steinbach, Edward J.	08/28/13	2	1.00
	Stewart, Jared L.	08/01/13	1	1.00
	Strezo, Fred R.	12/27/13	1	0.25
	Swierc, David J.	10/17/13	2	0.25
	Sypult, Brian D.	11/04/13	1	0.25
	Szczepaniak, Jeffrey T.	12/09/13	1	0.25
	Szumelda, Thomas M.	12/29/13	1	0.25
	Tavernier, Kevin D.	12/14/13	1	0.25
	Tegen, Andrew M.	09/15/13	1	1.00
	Titus, Robert J.	12/16/13	1	0.25
	Tredway, Brandon W.	07/03/13	1	1.00
	Turner II, James P.	11/08/13	1	0.25
	Tzavaras, Louis N.	10/21/13	2	0.25
	Velasquez, Nicholas M.	12/16/13	1	0.25
	Vicksinich, Mark T.	10/05/13	1	1.00
	Vujko, Jonathan B.	12/26/13	1	0.25
	Walton, Donald	12/13/13	1	0.25
	Wanicki, Fred L.	10/31/13	2	0.25
	Waszak, Jeffrey J.	12/16/13	1	0.25
	Weaver, Nathaniel T.	10/15/13	1	1.00
	Webb, Charles R.	09/14/13	1	1.00

# VTA - Attendance Report

All Employees(s)

From 06/30/13 To 12/31/13

Course	Student Name	Date	#	Hours
<b>(R) Benzene NESHAP-NSPS QQQ SOP Refresh (EASREG223)</b>				
	Welbourne, Timothy J.	11/10/13	1	0.25
	White, Steven J.	10/11/13	1	1.00
	Whitlock, Jeffery W.	11/01/13	1	0.25
	Wilson, Richard M.	09/27/13	1	1.00
	Woodward, Mark J.	12/04/13	1	0.25
	Wooten, Russell T.	08/27/13	2	1.00
	Wyand, John F.	08/04/13	1	1.00
	Zimpfer, Eric	12/01/13	1	0.25
<b>Site L6</b>				
	Altman, Aaron M.	10/03/13	1	1.00
	Choss, Gerald N.	08/11/13	2	1.00
	Cobb, Michael R.	12/27/13	1	0.25
	Grimmer, Natalie R.	07/12/13	1	1.00
	Hlavach, Jeffrey A.	07/08/13	1	1.00
	Lopez, Alvaro	09/25/13	1	1.00
	Macfarlane, Scott F.	08/21/13	2	1.00
	Massengill, Larry S.	08/01/13	1	1.00
	Stacey, James E.	06/30/13	1	1.00
	Welch, David M.	12/06/13	1	0.25

**Attendance Count: 207**